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ABSTRACT

Developed by high school teachers and junior college instructors in cooperation with representatives of business and industry, these materials are designed to help students move from class to class, from secondary to postsecondary education, and from school to employment. The materials consist of student outcomes; competencies for job or advanced placement; enabling tasks; a glossary; and sample records. Each competency is made up of a task (what the student must do to demonstrate an ability to do the job), conditions and limitations (a description of the circumstances under which the student will demonstrate the skill), and criteria of acceptable performance. The teacher key provides the correct answers to evaluations of these criteria. Competencies cover the following topics: blueprints, estimating, concrete slabs, concrete blocks and bricks, electrical systems, electrical material, plumbing systems, pipes, wallboard, shingles and flashings, wall paneling, paint and varnish, and installation of flooring, carpet, and ceramic tile. The enabling tasks are the activities necessary for developing a job skill; completion of all enabling tasks for a competency leads to achievement of that competency. Two record forms, one for charting competencies of all students in a class and the other an individual student record, complete the materials. (KC)

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ED234152

COMPETENCIES FOR ARTICULATION

RESIDENTIAL CONSTRUCTION

A Project in Vocational Education
Performed Pursuant to a Grant from the

**NEBRASKA STATE ADVISORY COUNCIL
FOR VOCATIONAL EDUCATION
Betty Abbott, Chairperson
for Research and Development Funds**

and

**THE GOVERNORS' SPECIAL GRANTS OFFICE
Pat Meinsenholder, Director
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**A Project of the
Lincoln Public Schools
Educational Service Unit No. 6
Southeast Community College**

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PREFACE

More emphasis than ever is being given to educational competencies. The public is questioning the basic abilities of graduates and is demanding that schools be more accountable for student performance. Educators are determined to give a clear definition of what students are expected to learn.

Although many people are interested in competencies, few seem able to explain what they mean or give specific examples. Staff members of this project can. They have addressed an important problem — articulation between schools — in terms of the competencies students should have.

Defining competencies will not necessarily improve articulation. That improvement demands understanding, trust and cooperation among all concerned. Neither does the definition assume full-fledged competency-based education — for that requires a complex system for instruction, assessment and certification that takes time to develop.

While these competency statements are not the whole picture, they are a significant achievement. If used properly, they will contribute to both better articulation and improved learning.

Ron Brandt
Executive Editor
Association for Supervision
and Curriculum Development
Washington, D.C.

The Competencies for Articulation in this volume represent a significant opportunity for instructional improvement and continuity of program for young men and women preparing for vocations. They are the product of cooperation among secondary and post-secondary educators, working with community representatives. Designed to be only one part of the students' educational experience, they need to be combined with skilled instruction and adequate environment.

Competencies have received much attention in educational literature in recent years. The wide variety of claims for their effectiveness from several sources has tended, sometimes, to either confuse or mislead both the public and professional educators. Experience has taught us that educational improvement cannot be based on a single idea or concept; therefore, these competencies are not the answer to all educational ills. They are, however, a valuable resource for clarifying and validating the instructional process required to produce the skills necessary for today's complex industrial-economic system.

James Travis
Associate Superintendent
for Instruction
Lincoln Public Schools
Lincoln, Nebraska

ACKNOWLEDGEMENTS

The significant contributions of committee members in the development of these materials are greatly appreciated. Members representing four educational agencies: the Lincoln Public Schools, Educational Service Unit No. 6, Southeast Community College, and Gretna Public Schools, combined skills to provide helpful materials for articulation purposes to teachers and administrators.

Persons representing business and industry in Lincoln, Milford and other cities in the Educational Service Unit and the Southeast Community College area also contributed expertise through a series of meetings. Vocational teachers from Lincoln and other communities, although not directly involved in the project, made similar contributions as materials were developed.

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INTRODUCTION

Professional staff members of the Lincoln Public Schools, Educational Service Unit No. 6, and the Southeast Community College have joined with representatives of business and industry in developing these instructional materials.

The educational materials in this guide may be used by administrators, students, and secondary and post-secondary vocational teachers. They are designed to help students move from class to class, grade to grade, secondary studies to post-secondary school or employment. The materials consist of:

1. Student Outcomes
2. Competencies for Job or Advanced Placement
3. Enabling Tasks
4. Glossary of Terms
5. Class Progress Chart, and
6. Record of Individual Student Skill Achievement

This information is not limited to a particular vocational course but to a set of competencies. These competencies describe skills necessary for success in initial employment or applicable to advanced placement for educational purposes.

Some schools may be able to provide more opportunities for students to complete competencies and tasks than others. Whatever the case, teachers and administrators will find the materials helpful when planning programs for students and for determining what educational experiences may be made available to them. Students may use the materials to understand and plan the skill developments necessary for employment and additional education.

Teacher and students should keep records of competencies as they develop. Two record forms, one for charting competencies of all students in a class, the other an individual student record, are included in the materials. These records may be used by students and teachers to chart progress toward specific job skills, and as achievement records for presentation with job or post-secondary school applications.

"Competencies for Articulation — Residential Construction" was designed to be used in conjunction with "Competencies for Articulation — Carpentry". "Residential Construction" does not duplicate any of the "Carpentry" areas except the roofing competencies. The Carpentry (rough/finish) competencies are not included in "Residential Construction."

STUDENT OUTCOMES

Information that will help administrators, teachers, and students plan programs at both secondary and post-secondary levels is provided. It applies to:

1. Planning and preparing for job opportunities and placement;

2. Planning and preparing for advanced placement in post-secondary education;

3. Allowing high school credits for previous experience.

"Student outcomes" describe what instruction has prepared a student to do.

JOB OPPORTUNITIES

Many Residential Construction positions available in the Lincoln community and in surrounding areas are listed along with the Dictionary of Occupational Titles and the Office of Education codes.

Recommended competencies to be developed by students for intial employment are given. Students may use this information to plan and prepare school experiences properly.

Dictionary of Occupational Titles Code Number	Office of Education Code Classification	Occupational Title	Competencies Necessary for Initial Employment	Recommended Additional Training
160.267	14.0101	Estimator	1,2,5,6,13,14	Architectural Drafting, Math, Carpentry
740.684	17.1005	Painter, brush	1,2,21	Art, Apprenticeship
741.684	17.1005	Painter, spray	1,2,21	Art, Apprenticeship
749.684	17.1005	Painter, touch-up	1,2,21	Art, Apprenticeship
824.261	17.1002	Electrician apprentice	1, 5 through 12	Electricity, Electronics, Apprenticeship
824.261	17.1002	Electrician	1, 5 through 12	Electricity, Electronics, Apprenticeship, Certification
829.281	17.1002	Electrician repairer (maintenance)	1, 5 through 12	Electricity, Electronics, Apprenticeship
829.684	17.1002	Electrician helper	1, 5 through 12	Electricity, Electronics, Apprenticeship
840.381	17.1005	Painter, construction	1,2,21	Art, Apprenticeship
842.381, 842.681	17.1008	Drywall applicator	1,2,19	Apprenticeship, Carpentry
842.664	17.1008	Taper	1,2,19	Apprenticeship, Carpentry
844.364	17.1099	Cement mason	1,2,3	Apprenticeship, Carpentry
844.364	17.1099	Cement mason apprentice	1,2,3	Apprenticeship, Carpentry
861.381	17.1004	Bricklayer	1,2,4	Apprenticeship, Welding
861.381	17.1004	Bricklayer apprentice	1,2,4	Apprenticeship, Welding
861.381	17.1004	Soft-tile setter	1,2,25	Apprenticeship, Welding
861.381, 861.684	17.1004	Tile setter	1,2,25	Apprenticeship, Welding
861.381	17.1004	Tile setter apprentice	1,2,25	Apprenticeship, Welding

Dictionary of Occupational Titles Code Number	Office of Education Code Classification	Occupational Title	Competencies Necessary for Initial Employment	Recommended Additional Training
862.381, 862.681	17.1007	Plumber	1, 13 through 17	Welding, Apprenticeship, Certification
862.381	17.1007	Plumber apprentice	1, 13through 17	Welding, Apprenticeship
864.381	17.1099	Carpet layer	1,2,22,23,24	Apprenticeship, Carpentry
864.481	17.1099	Floor layer	1,2,22,23,24	Apprenticeship, Carpentry
864.481	17.1099	Floor layer apprentice	1,2,22,23,24	Apprenticeship, Carpentry
864.687	17.1099	Carpet layer helper	1,2,22,23,24	Apprenticeship, Carpentry
866.381	17.1010	Roofer	1,2,18	Apprenticeship, Carpentry
866.381	17.1010	Roofer apprentice	1,2,18	Apprenticeship, Carpentry
869.281	17.10	House builder	all	Woodwork, Carpentry, Metalwork, Drafting, Welding, Apprenticeship, Electricity, Electronics
869.381	17.10	House repairer	all	Drafting, Welding, Woodwork, Carpentry, Apprenticeship, Electricity, Electronics
869.381	17.10	Pipe installer	1,5,6,9	Welding
869.384	17.10	Repairer, manufactured buildings	all	Drafting, Welding, Electricity, Electronics, Woodwork, Carpentry
869.664	17.10	Construction worker	all	Drafting, Welding, Woodwork, Metalwork, Carpentry, Electricity, Electronics, Apprenticeship
869.684	17.10	Assembler	all	Woodwork, Metalwork, Drafting, Carpentry, Welding, Electricity, Electronics
869.684	17.10	Installer	all	Woodwork, Metalwork, Drafting, Carpentry, Welding, Electricity, Electronics
869.684	17.10	Lay-out worker	1,2,19,20	Woodwork, Drafting, Carpentry
869.684	17.10	Panel installer	1,19,20	Woodwork, Drafting, Carpentry
869.684	17.10	Roof assembler	1,19,20	Woodwork, Drafting, Carpentry, Metalwork
869.684	17.10	Sheetrock applicator	1,19	Woodwork, Drafting, Carpentry
899.381	17.10	Maintenance repairer, building	all	Drafting, Welding, Woodwork, Metalwork, Electricity, Electronics, Carpentry

ADVANCED PLACEMENT POLICY STATEMENT

Southeast Community College
Lincoln and Milford Campuses

The College believes that students should be recognized and rewarded for previous educational and occupational experience when that experience results in competence in areas normally addressed by the courses and programs of the College. Advanced standing may be awarded with full credit, up to limits established by each department of the College, but not exceeding 30 credit hours. Credits earned in other accredited educational institutions in excess of 30 hours may be accepted by the department.

The College has established the following methods to enable students to gain advanced standing:

CREDIT BY EXAMINATION

Some courses have been identified which may be completed by examination. Testing devices and evaluation procedures will vary according to the course, departmental requirements, and the amount of credit being advanced.

To apply for credit by examination, the applicant must have been accepted for admission to the College and have established a transcript. Applications for Credit by Waiver or Examination must be submitted to the department from which credit would be granted.

Applicants for credit by examination must pay the following: 50% of the current per credit hour fee for each credit hour attempted by examination. This fee must be paid prior to the examination.

A "Credit by Examination Notice" will be forwarded to the Campus Registrar for all credit granted by examination. The Registrar will record all credit granted as "Px" (Passed by Examination) on the transcript. No honor points will be awarded and the credit by examination will not be included in the cumulative grade point average (CGPA).

CREDIT BY WAIVER

Some courses and series of courses have been identified which may be waived in meeting program graduation requirements.

Students requesting advanced standing Credit by Waiver must: Complete an Application for Credit by Waiver or Examination and submit the application for evaluation to the department granting the waiver.

Upon completion of the evaluation, submit the application and evaluation to the Campus Registrar for recording on their transcript.

The following entry will be made on the student's transcript for all course credit granted by waiver: "The following program requirements were waived by substituting previous education and/or occupational experience. (List course waived.) This waiver of program requirements was granted this date ____/____/____ by _____ (evaluator) and is in accordance with Department, Campus and Area policies, rules and regulations."

No fee will be charged for advanced Credit by Waiver.

Credit by Waiver will not be included in calculating student's grade point average (CGPA).

Credit granted by waiver is subject to evaluation by other departments, programs and other institutions and probably would not be accepted as transfer credit by them.

Credit granted by waiver will be contingent upon satisfactory completion of advanced courses.

ADVANCED PLACEMENT

Southeast Community College
Milford Campus

Advanced placement in the Residential Construction Program of the Milford Campus of Southeast Community College will be determined on the basis of competencies which the prospective student demonstrates according to the following:

Students Demonstrating Competency No.	SCC Credit In the Amount of	Course No.	Course Title
1	1	4700223	Building Construction Blueprint Reading
2	2	4700328	Residential Construction Estimating Lab
3	½	4700122	Reinforced Concrete, Steel & Masonry Structures
4	2	4700122	Reinforced Concrete, Steel & Masonry Structures
5	¼	5230342	Electrical Systems I Laboratory
6	⅓	5230342	Electrical Systems I Laboratory
7	3/20	5230342	Electrical Systems I Laboratory
8	1/20	5230342	Electrical Systems I Laboratory
9	⅓	5230342	Electrical Systems I Laboratory
10	9/20	5230342	Electrical Systems I Laboratory
11	1/10	5230342	Electrical Systems I Laboratory
12	3/20	5230342	Electrical Systems I Laboratory
13	1	4400233	Plumbing Theory II
14	½	4400119	Design, Estimating, Blueprint Reading & Drafting
15	½	4400233	Plumbing Theory II
16	½	4400233	Plumbing Theory II
17	½	4400233	Plumbing Theory II
18	1	4700532	Building Construction I
19	½	4700224	Woodworking Processes & Practices
20	¼	4700224	Woodworking Processes & Practices
21	¼	4700225	Tools & Materials
22	1/8	4700225	Tools & Materials
23	1/8	4700225	Tools & Materials
24	1/8	4700225	Tools & Materials
25	1/8	4700224	Woodworking Processes & Practices

The program supervisor of the Residential Construction Program has the responsibility for conducting and evaluating examinations to determine the competency level of students requesting consideration under this agreement.

Examinations used for evaluation purposes will be updated from time to time although every effort will be made to maintain their consistency with the competencies identified in this agreement.

This agreement cannot, however, be considered a contract between Southeast Community College—Milford Campus and any prospective student. The Board of Governors of the College reserves the right to make changes in courses required, courses offered, credits waived, credits granted, and in any other matter it deems necessary without revision of this agreement and without notice. Prospective students wishing consideration under this agreement should contact the program supervisor in order to establish and maintain a close working relationship between the College, its program, and the student.

HIGH SCHOOL CREDIT

Amounts of high school credit are suggested for each competency. It is the responsibility of each educational agency to determine the level of competency and the amount of credit to be awarded.

Competency	Semester Credit Hours	Competency	Semester Credit Hours
1	1½	14	½
2	½	15	½
3	1	16	1
4	2	17	1
5	½	18	1
6	½	19	1½
7	½	20	½
8	½	21	½
9	½	22	½
10	1	23	1
11	1	24	1
12	½	25	½
13	½		

COMPETENCIES

A competency consists of three sections or parts that combine to provide a detailed outline of a major task that a student must accomplish to reach one or more previously stated student outcomes. Competencies are described as follows:

a. Task — What the student must do to demonstrate an ability to do the job.

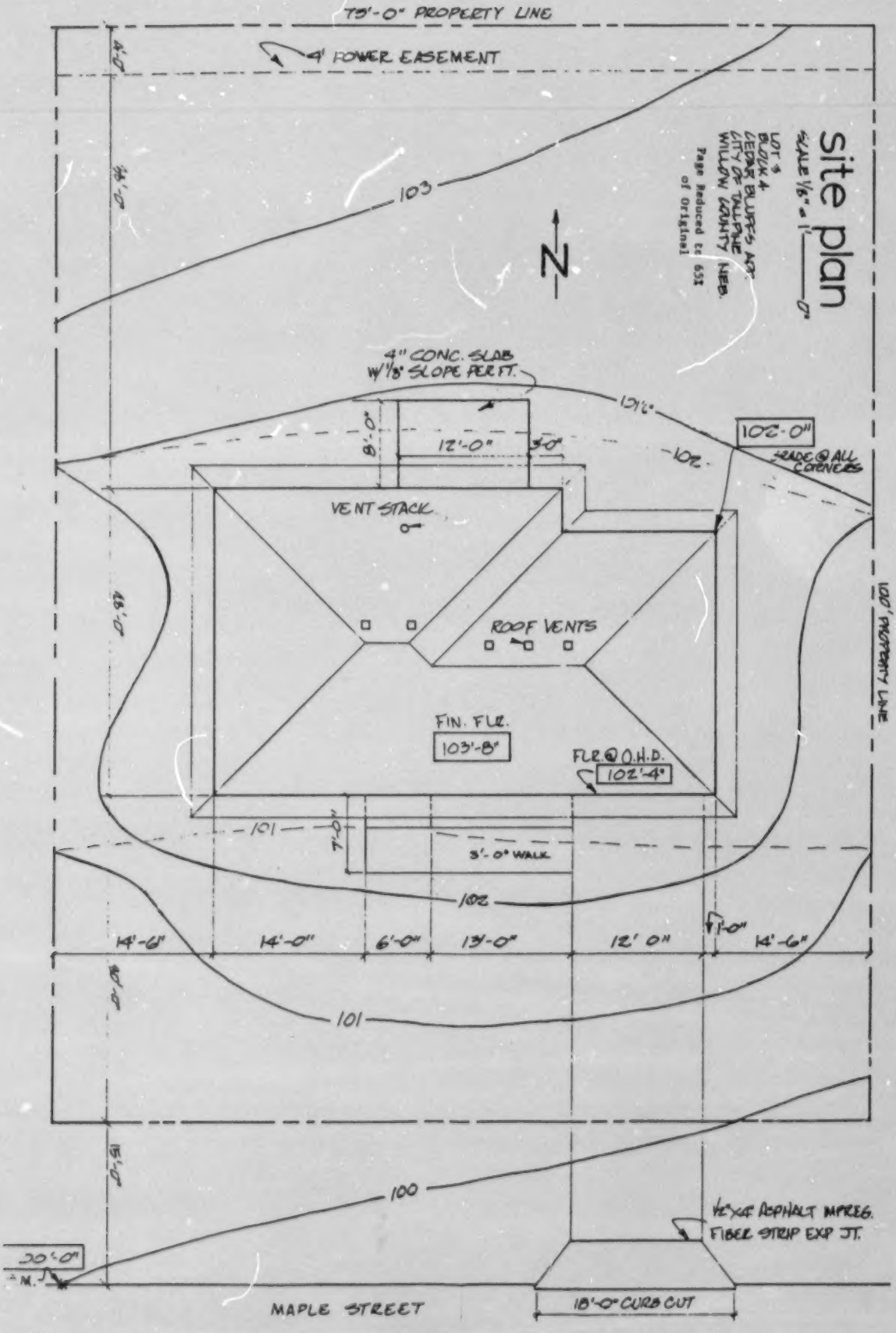
b. Conditions and Limitations — A description of the circumstances under which the student will demonstrate the skill. Usually included are:

   1. time allowance;
   2. tolerances allowed;
   3. references which may be used;
   4. specific tools and materials to be used (common tool lists are generally omitted unless a required usage is to be demonstrated);
   5. work location (if other than school site);
   6. and, other limitations unique to the task.

c. Criteria of Acceptable Performance — Standards described that constitute acceptable performance. These standards must:

   1. be compatible with the task and the condition;
   2. evaluate all components of the conditions;
   3. include the percentage of responses that must be correct if the competency is primarily cognitive;
   4. and, specify the standard for the criteria. This may take the form of a list of criteria, an instructor's checklist, or references to an authoritative manual such as an automotive flat-rate manual.

Represented in the guide are those competencies needed for initial employment. They are not designated or described by grade level. A student may complete all the competencies available at a school if learning capabilities and time permit.


75'-0" PROPERTY LINE
4' POWER EASEMENT
4'-0"
46'-0"
103
site plan
SCALE 1/8" = 1'-0"
LOT 3
BLOCK 4
DEERE BLUFFS ADT.
CITY OF TALLPINE
WILLOW COUNTY NEB.
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N
4" CONC. SLAB W/1/8" SLOPE PER FT.
8'-0"
12'-0"
3'-0"
101½
102'-0"
GRADE @ ALL CORNERS
102
VENT STACK
ROOF VENTS
48'-0"
FIN. FLR.
103'-8"
FLR @ O.H.D.
102'-4"
101
7'-0"
3'-0" WALK
102
14'-6"
14'-0"
6'-0"
13'-0"
12'-0"
1'-0"
14'-6"
80'-0"
101
151'-0"
100
½" x 4" ASPHALT IMPREG. FIBER STRIP EXP JT.
20'-0"
± M. J.
MAPLE STREET
18'-0" CURB CUT
100' PROPERTY LINE

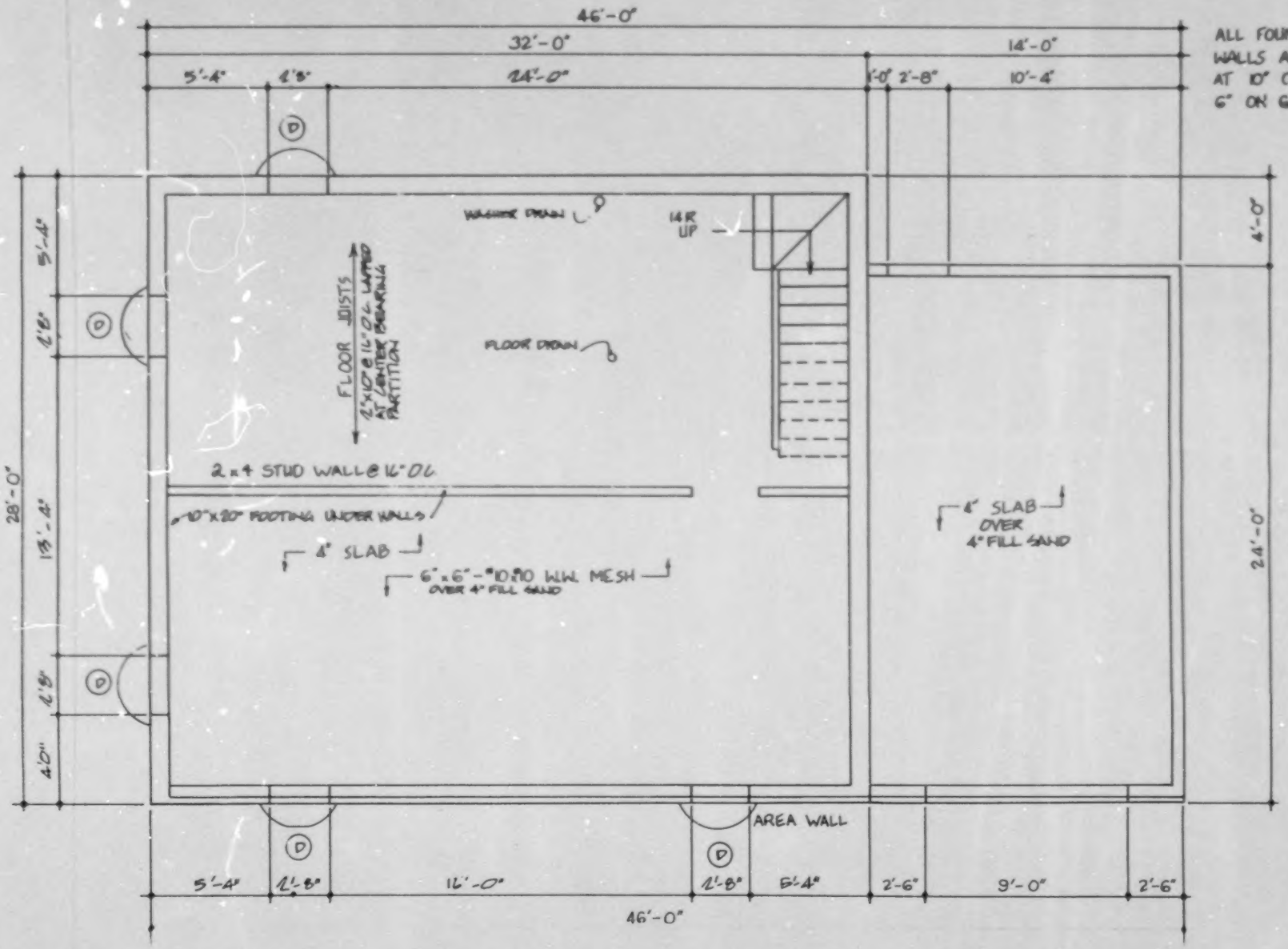

Figure 26c

foundation plan

SCALE - 1/4" = 1'-0"

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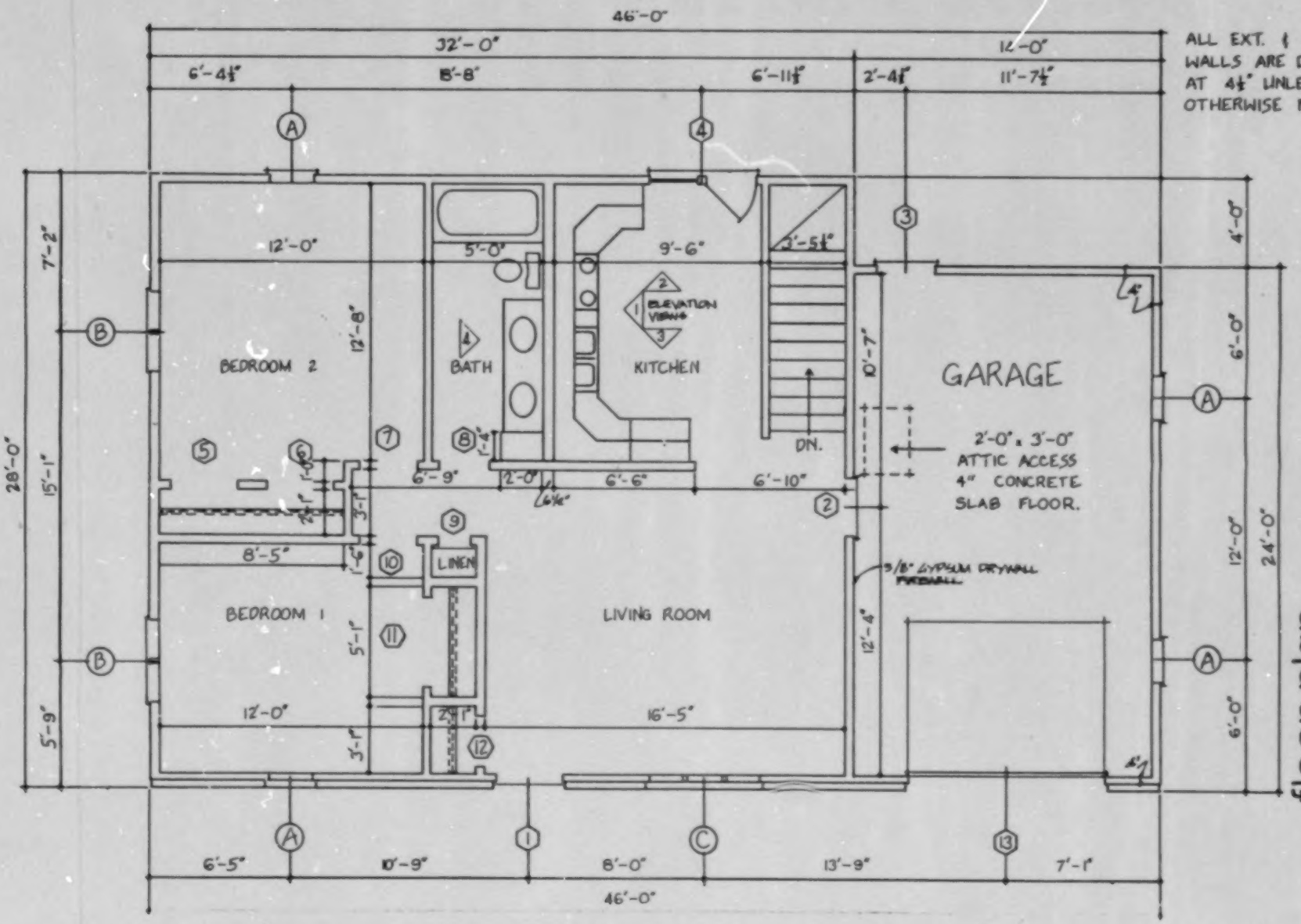
46'-0"
32'-0"
12'-0"
6'-4½"
15'-8"
6'-11½"
2'-4½"
11'-7½"
ALL EXT. & INT. WALLS ARE DIMENSIONED AT 4½" UNLESS OTHERWISE NOTED.
28'-0"
15'-1"
7'-2"
5'-9"
12'-0"
5'-0"
9'-6"
2'-5½"
4'-0"
6'-0"
12'-0"
24'-0"
BEDROOM 2
12'-8"
BATH
KITCHEN
ELEVATION VIEWS
DN.
GARAGE
10'-7"
2'-0" x 3'-0" ATTIC ACCESS
4" CONCRETE SLAB FLOOR.
6'-9"
2'-0"
6'-6"
6'-10"
6½"
3'-1"
8'-5"
LINEN
BEDROOM 1
LIVING ROOM
5'-1"
5/8" GYPSUM DRYWALL FIREWALL
12'-4"
12'-0"
16'-5"
3'-1"
6'-5"
10'-9"
8'-0"
13'-9"
7'-1"
46'-0"
N
floor plan
SCALE: ¼"-1'-0"
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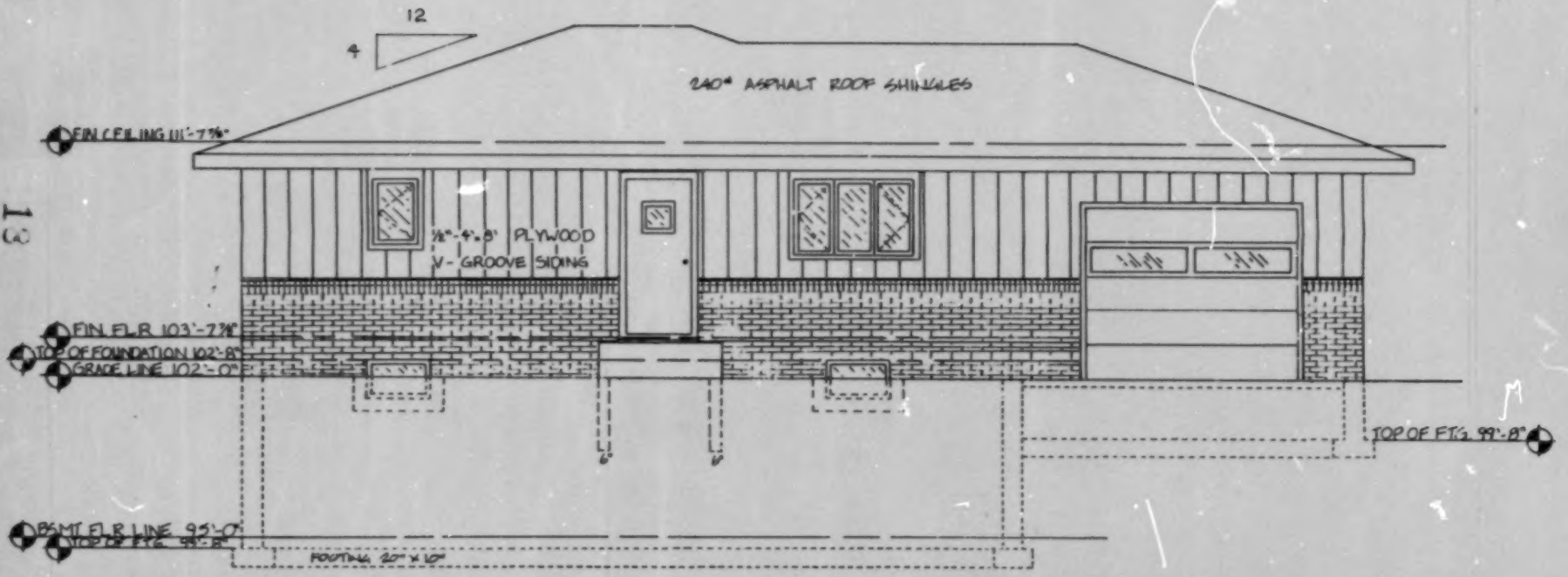
17

Figure 26a



FRONT ELEVATION

SCALE ¼"=1'-0"

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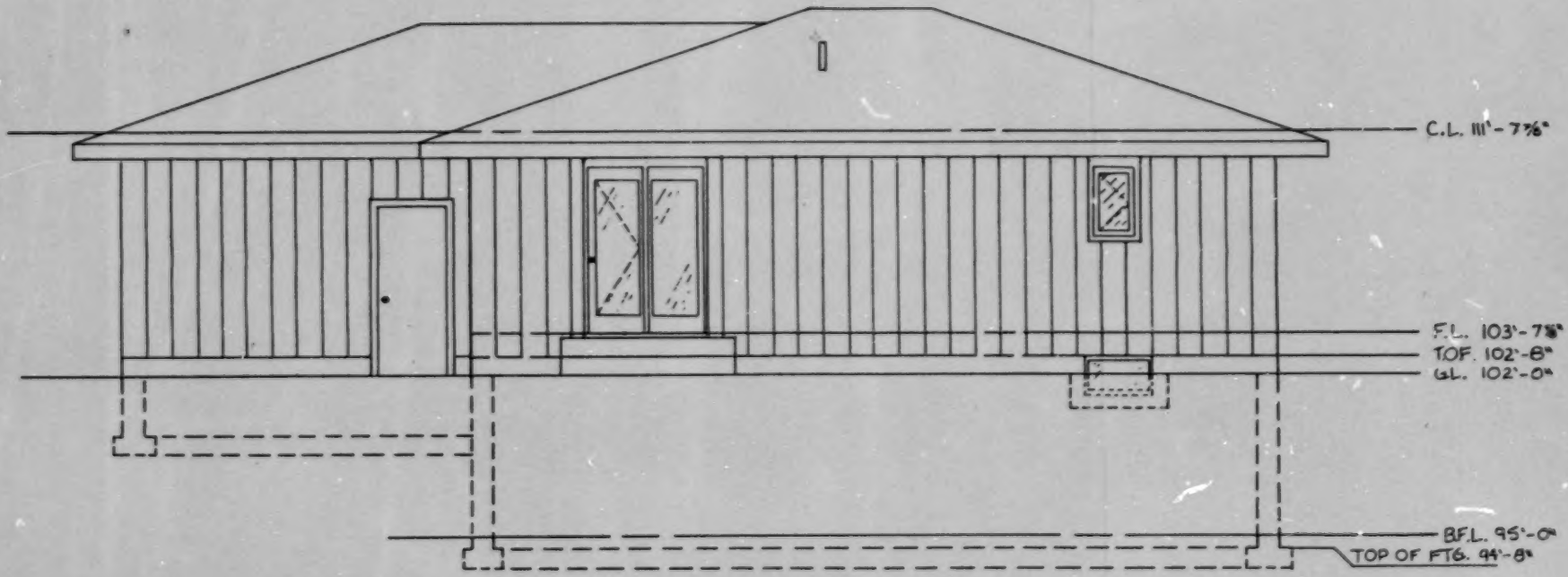
Figure 26f



REAR ELEVATION

SCALE: ¼" = 1'—— 0"

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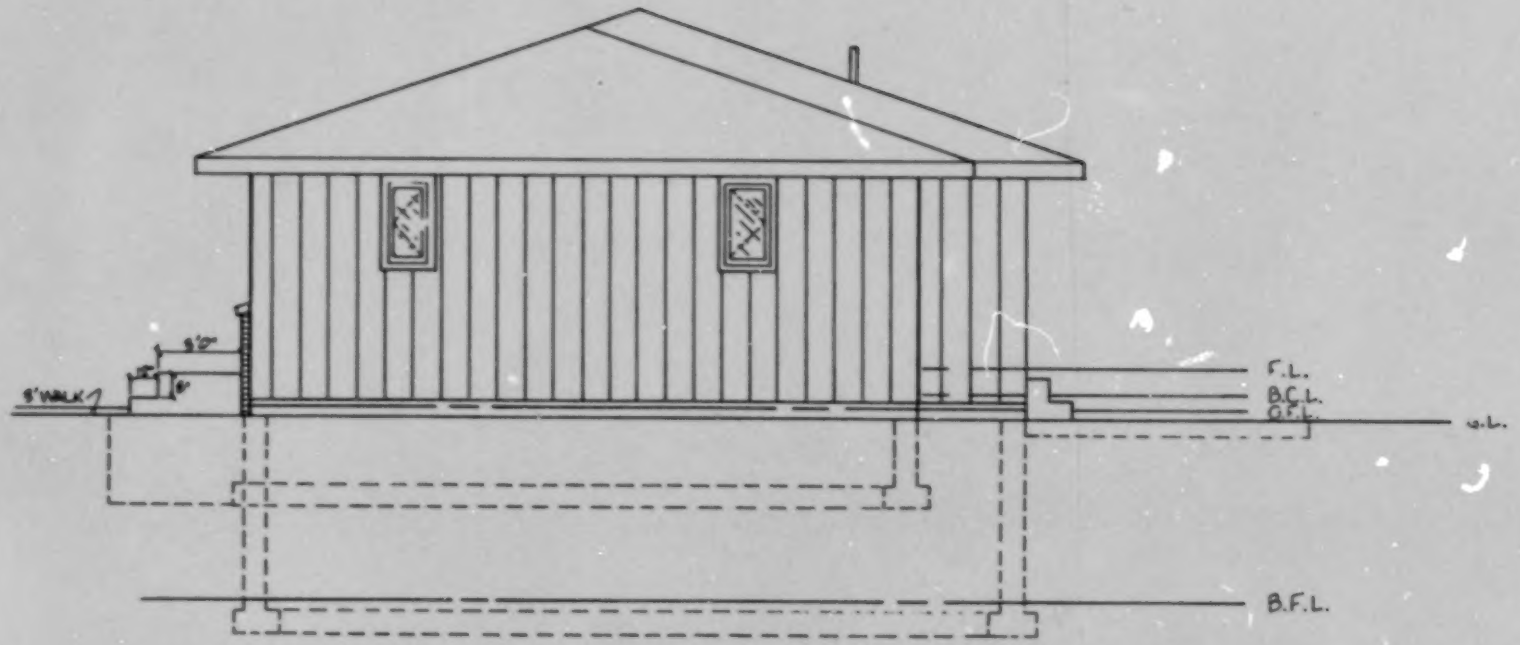
Figure 24g



RIGHT ELEVATION

SCALE: 1/4" = 1'

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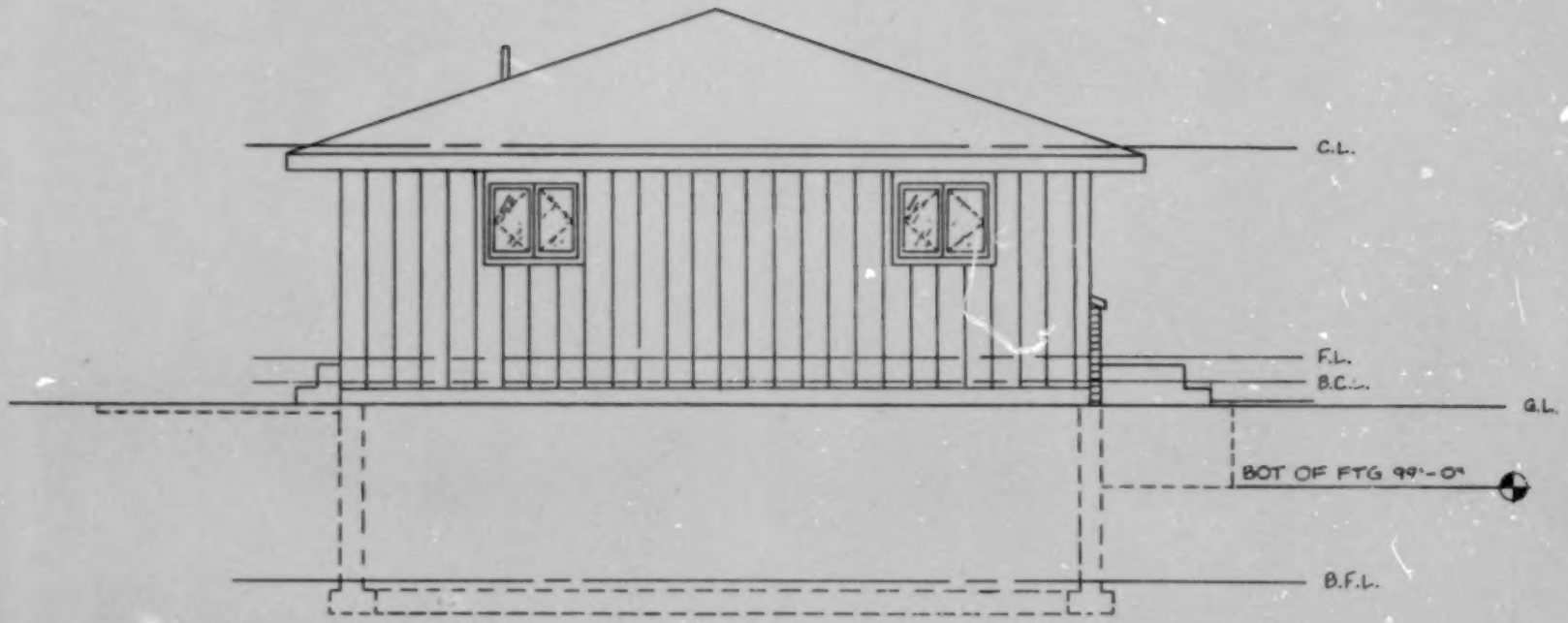
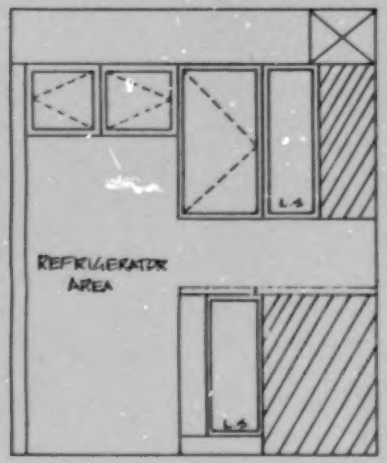
Figure 26b



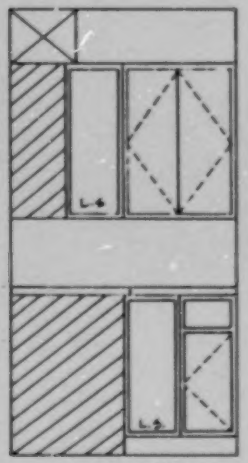
LEFT ELEVATION

SCALE: 1/4" = 1'-0"

Page Reduced to 65% of Original



3. SOUTH WALL ELEVATION
KITCHEN



2. NORTH WALL ELEVATION
KITCHEN

SCALE : ½" = 1' —— 0"

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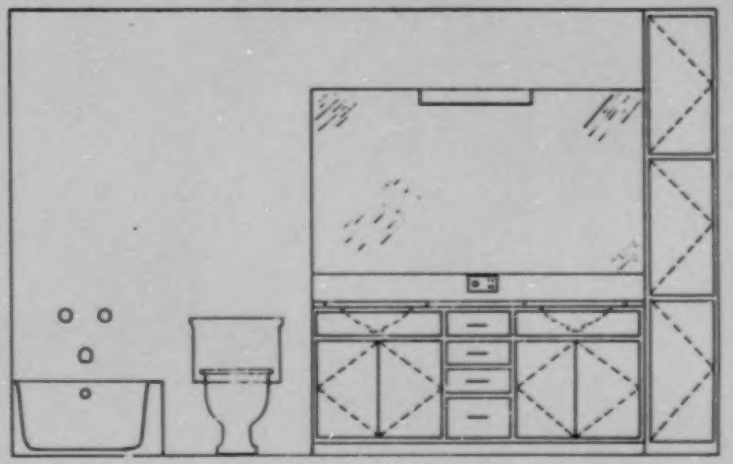
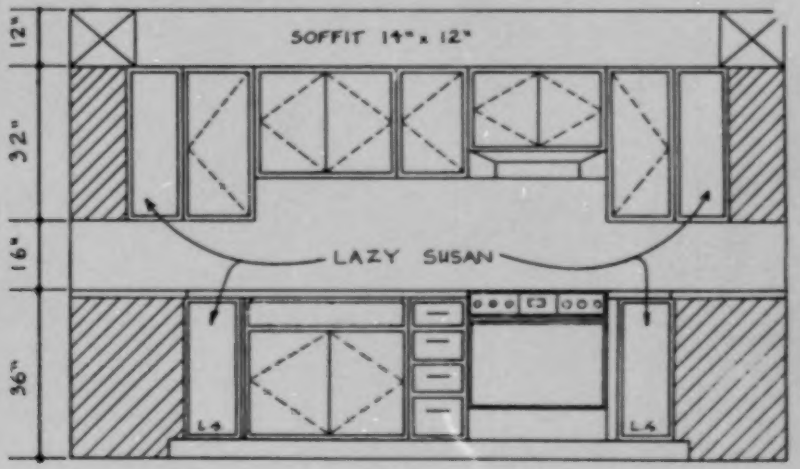
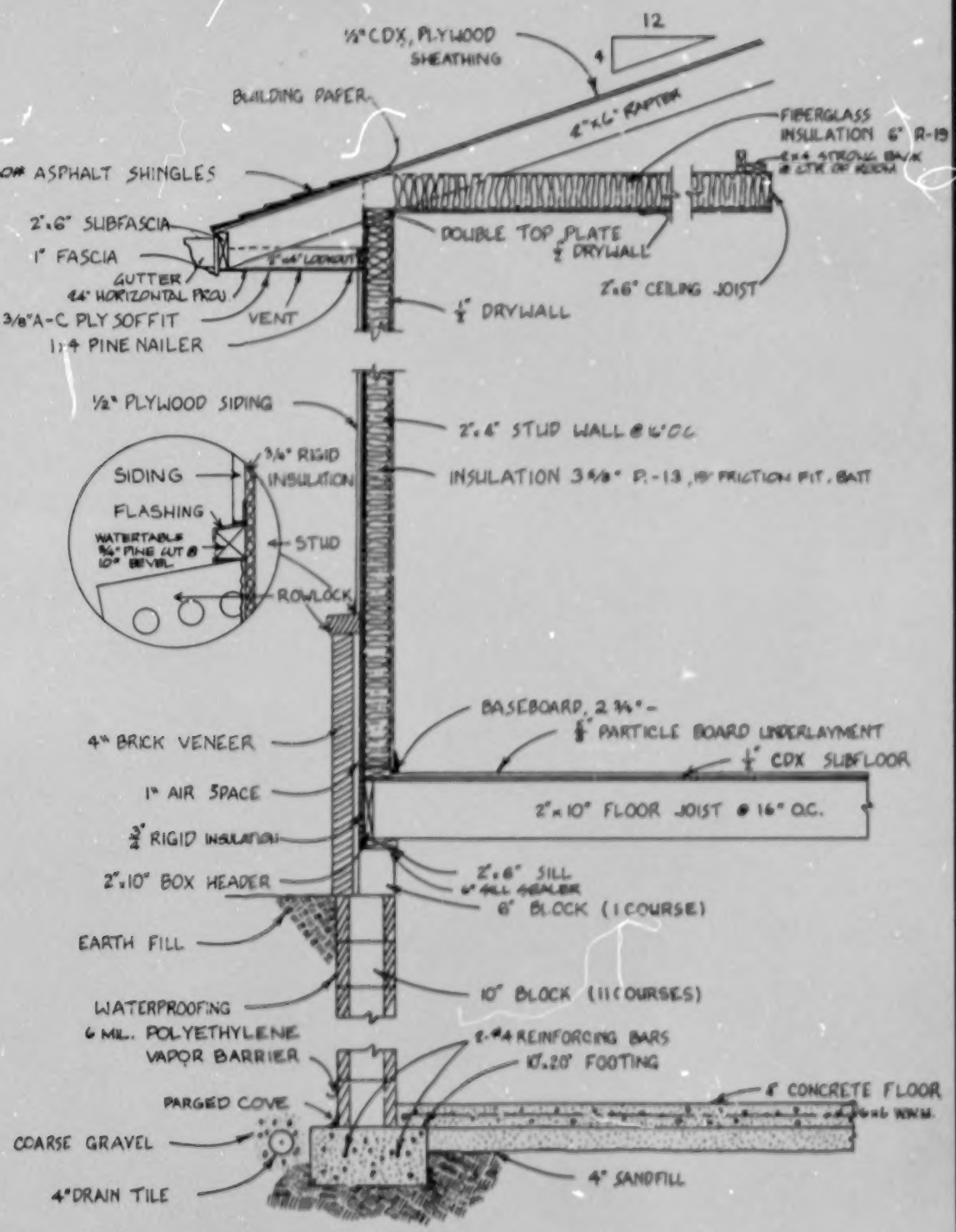


4. EAST WALL ELEVATION
BATHROOM



1. WEST WALL ELEVATION
KITCHEN



WALL SECTION

SCALE ¾" = 1'-0"

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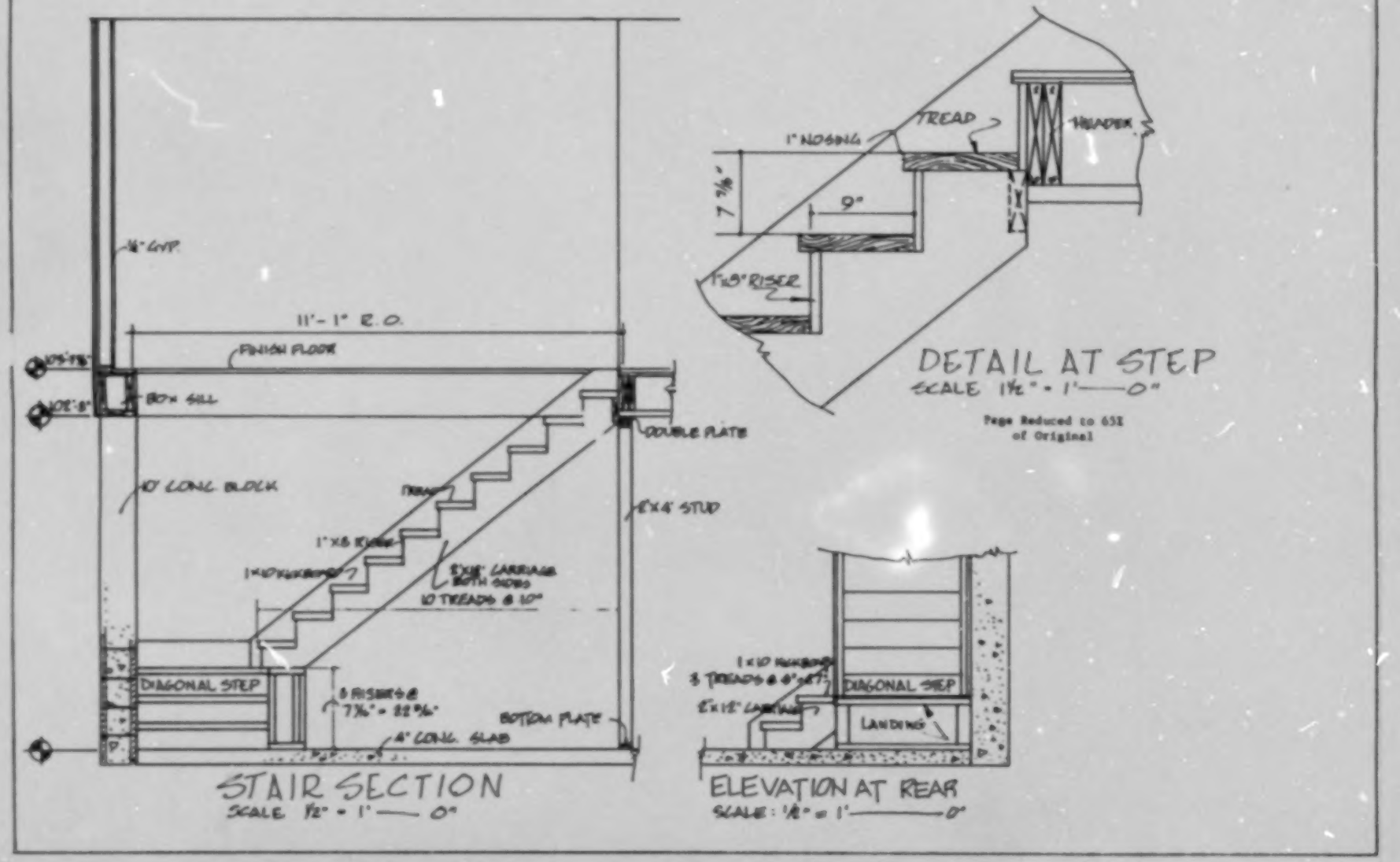

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DOOR SCHEDULE

DOOR NUMBER	TYPE	SIZE									THICKNESS 1¾"	THICKNESS 1⅜"	JAMB OPENING	ROUGH OPENING	MATERIAL	DETAILS HEAD	DETAILS JAMB	DETAILS SILL	REMARKS
		1'-6"	2'-4"	2'-6"	2'-8"	3'-0"	3'-4"	5'-0"	6'-0"	7'-0"									
1	WD FLUSH				X							X	4'-9½"	5'-1½" x 6'-10½"	R. OAK				HOLLOW CORE
2	PANEL				X						X			2'-10⅜" x 6'-8⅝"					9 LITE, 5/8H
3	PANEL				X						X			"	↓				"
4	PATIO						X					X		5'-0" x 6'-8⅝"	WHITE ENAM.				ATRIUM UNIT, WALK CUT
5	BI-FOLD					X					X			5'-1⅛" x 6'-10⅛"	R. OAK				4 FR
6	BI-FOLD					X					X			5'-1⅛" x 6'-10⅛"	↓				4 PD
7	FLUSH				X						X			2'-10⅛" x 6'-10⅛"					
8	FLUSH			X							X			2'-4⅛" x 6'-10⅛"					
9	FLUSH	X									X			1'-0⅛" x 6'-10⅛"					
10	FLUSH				X						X			2'-10⅛" x 6'-10⅛"					
11	BI-FOLD						X				X			5'-1⅛" x 6'-10⅛"					4 PD
12	FLUSH			X							X			2'-4⅛" x 6'-10⅛"	↓				
13	OVERHEAD								X		X		↓	9'-0" x 7'-0"	FIR				RAISED PANELS

WINDOW SCHEDULE

WINDOW NUMBER	TYPE	ROUGH OPENING	MANUFACTURE	CATALOG NUMBER	DETAILS HEAD	DETAILS JAMB	DETAILS SILL	REMARKS
A	PICTURE CASE.	2'-4⅛" x 9'-5¾"	ANDERSEN	WR1018				GLASS 22⅝" x 93" - 2 @
B	↓	6'-8⅛" x 5'-6¾"		WEHS				GLASS 20⅛" x 64" x 2 - 2 @
C		6'-8⅛" x 5'-5⅜"		WEHD				GLASS 20⅛" x 60⅝" x 3 @
D	BASEMENT	2'-8⅝" x 1'-7½"	↓	2817	HEEP CASH		SPACE	GLASS 27¾" x 19¾" x 5 @

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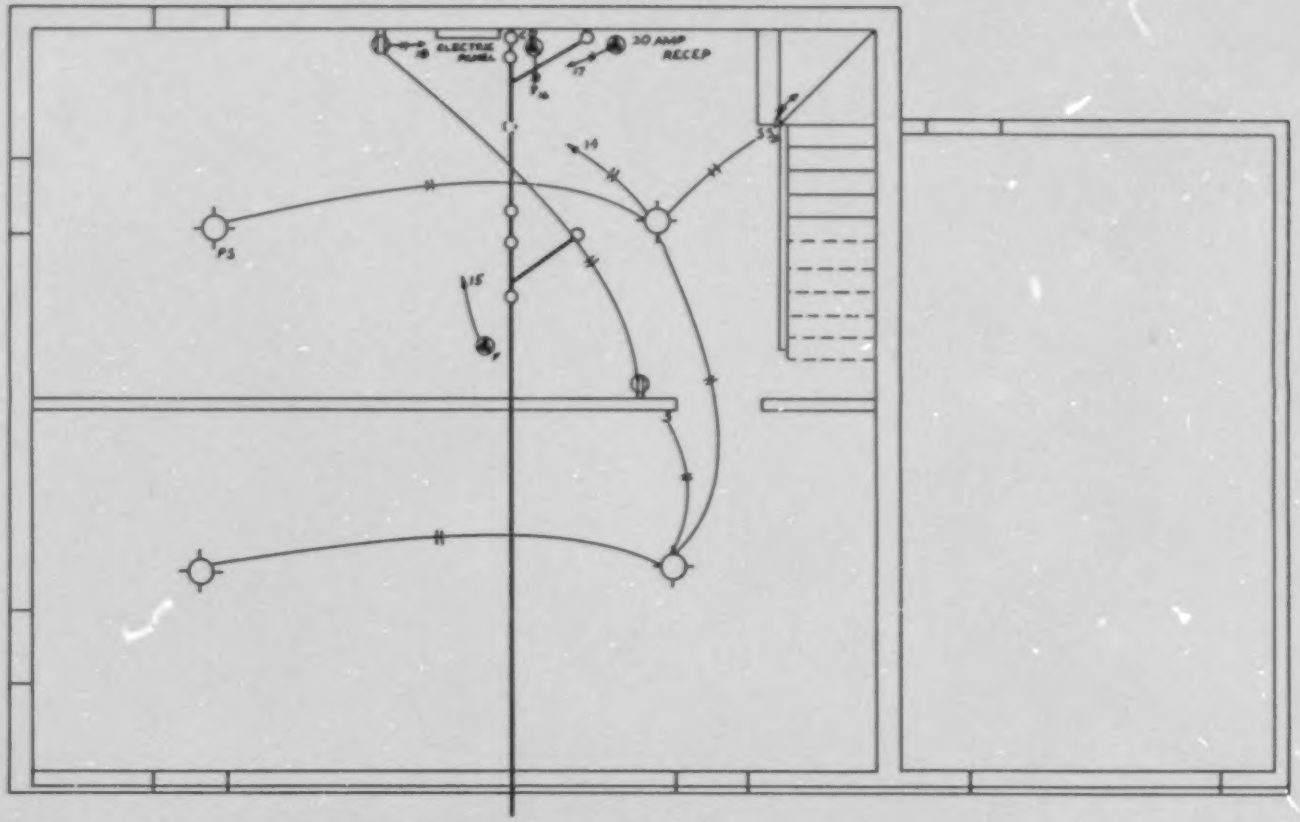
Figure 26m



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TASK:

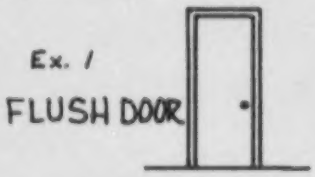
To read and interpret blueprints.

CONDITIONS AND LIMITATIONS:

Given a set of blueprints (Figure 26-n), that contain a site plan, foundation plan, floor plan, exterior elevations, wall sections, stair section, interior elevations, architects scale, and a Uniform Building Code book, the student will respond to the following questions dealing with conventions, symbols, terms, abbreviations, notations, material details and code requirements. No time limit. Uniform Building Code may be used.

1. The following sketches represent 2 examples of:

   a. notations
   b. conventions
   c. schedules
   d. specifications

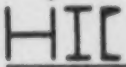


2. Match the following symbols found on a set of blueprints.

a.

b.

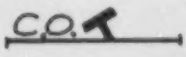
c.


d.

e.

f.

g.



h.

i.

j.

   1. public telephone
   2. three-way switch
   3. door identification
   4. waste clean-out
   5. duplex convenience outlet
   6. brick veneer on frame wall
   7. window identification
   8. structural steel members
   9. concrete
   10. earth (section view)

3. Indicate the meaning of the following abbreviations.

   a. A.S.T.M.
   b. arch.
   c. ftg.
   d. exc.
   e. F
   f. Kw
   g. o.c.
   h. perp.
   i. sdg.

4. Place the correct construction term after the definition.

   a. A summary of all deeds, wills and legal actions to show ownership.

   b. The upper portion of a soil or waste stack above the highest fixture.

c. A piece of wood made of three or more layers of veneer joined with glue and usually laid with the grain of adjoining plies as right angles.

d. An imaginary line on a plot beyond which the building cannot exceed.

e. A horizontal member fastening opposing rafters below the ridge in roof framing.

f. A recessed area below grade around the foundation to allow light and ventilation into a basement window or doorway.

g. A collection of legal requirements for buildings, designed to protect the safety, health and general welfare of people who work and live in them.

h. In electrical work, a channel that carries wires for protection and for safety.

i. The face or front elevation of a building.

j. A roof with four sloping sides.

5. Information indicating a particular project, designer, page number and name of drawing can be found in the _____.

   a. floor plan
   b. specification section
   c. window schedule
   d. title box

6. The example listed below is called a _____.

   a. detail
   b. notation
   c. schedule
   d. code

   EXAMPLE: 1/2" x 10" long anchor bolt embedded 7" into conc., 6' -0" o.c., 12" from corners.

7. Working drawings may be reproduced by an ammonia vapor process to make "blueprints" available for all interested parties. (true or false)

8. _____represent the exact form and size (perhaps scaled down) of each side of an object in two or more views (or planes) usually at right angles to each other.

   a. pictorial drawings
   b. construction details
   c. isometric drawings
   d. orthographic drawings

9. The *primary* purpose of details is to illustrate, on a larger scale:

   a. critical dimensions
   b. describe materials
   c. indicate maximum and minimum details
   d. method of assembly

10. Details are *usually* drawn in which view.

   a. pictorial
   b. section
   c. elevation

11. Indicate any three plans on the given blueprint drawn to a scale of 1/4" = 1" - 0".

12. The living room measures _____ x _____ and contains _____ sq. feet.

13. The house dimensions are _____ x _____ excluding the garage.

14. The minimal window glass area necessary for a bedroom required by the Uniform Building Code is ____%.

15. Bedroom #2 has _____ sq. feet of glass area in the windows.

16. The framing has the studs placed at _____" o.c.

17. The top of the footing elevation is _____ below the finish ceiling line in the wall.

18. The foundation has a center bearing device of what type extending the length of the house?

   a. steel "I" beam
   b. wood built-up girder
   c. solid wood girder
   d. steel channel beam
   e. wood frame wall

19. The floor joists, ceiling joists and rafters are all spaced @16" o.c. (True or False).

20. The floor joists under the bedroom are cut from 2 x 10 stock, _____' in length.

21. The 4" concrete slab in the garage floor contains _____ cubic feet of concrete.

22. The center bearing partition is carried by a concrete footing of what size?

23. The theoretical elevation of the primary ridge is _____.

24. The finished ceiling height of the rooms exceed the code minimums for Group R occupancies by _____.

   a. 2"
   b. 4"
   c. 6"
   d. 8"

25. ____are the architects main concern, they dictate the design and construction techniques for a specific structure.

   a. construction documents
   b. details
   c. architectural drawings

26. Identify any five components listed as architectural drawings.

27. _____ are an integral part of the construction documents since they define the responsibilities of the general contractor and the various trades that are responsible for their phase of the construction.

    a. specifications
    b. structural drawings
    c. building codes

28. A plot plan is a, (an) _____ view.

    a. auxillary
    b. elevation
    c. section
    d. topographic

29. What is the elevation of the southeast corner of the lot?

30. The proposed grade elevation of the ground immediately adjacent to the house is _____.

31. The setback of the house from the front property line is _____ .

32. If lot 3 on the plot plan costs $9500, what would be the cost per square foot of the lot?

33. What is the elevation of the finished floor above the datum point? (Bench mark?)

34. A "free of construction" easement exists on Lot #3. (True or False)

FOUNDATION PLAN

35. Dimensions shown on the foundation plan are indicated from corners to centerlines of openings. (True or False)

36. How do basement window openings occur in relation to windows on the first level?

    a. along side of
    b. offset 24" to 48"
    c. centered below

37. The foundation wall is placed flush with the exterior of the footing. (True or False)

38. A cutting plane at the foundation wall would relate directly to:

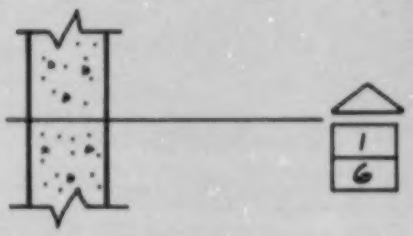
    a. an elevation drawing
    b. a mechanical plan
    c. a section or detail

39. Perimeter measurements on the foundation wall are taken from the _____.

    a. exterior of the wall
    b. interior of the wall
    c. center line of the wall

40. To what scale is the foundation plan drawn?

41. The following symbol indicates a cutting plane through the foundation. Indicate the meaning of the numbers.



42. Dimension lines are supported and limited by extension lines on the blueprint. (True or False)

43. Area walls are indicated on the foundation plan. (True or False)

44. No metal reinforcing is shown in the concrete floor (exclude the garage) (True or False).

FLOOR PLAN

45. The exterior frame dimensions of the house are equal to the foundation dimension. (True or False)

46. The house has floor joists running in which direction?

    a. North and South
    b. East and West

47. The interior walls are dimensioned at _____ unless otherwise noted.

    a. 3 1/2"
    b. 4"
    c. 4 1/2"
    d. 5"

48. *All* of the plumbing is clustered in the rear half of the house with no supply lines extending into the front half. (True or False)

49. How many interior doors are shown?

    a. 6
    b. 7
    c. 8
    d. 9

50. How many window units are in the living room?

    a. 1
    b. 2
    c. 3

51. Indicate the number of closets on the floor plan.

    a. 3
    b. 4
    c. 5
    d. 6

52. Bedroom #2 has a private bathroom. (True or False)

53. Bedroom #2 is larger than bedroom #1. (True or False)

54. The hall length is

a. 6' - 1"
b. 5' - 6"
c. 3' - 1"

EXTERIOR ELEVATIONS

55. The house can best be described as

a. A one story house with attic and garage.
b. A one story L-shape house.
c. A two story rectangular shape house with garage.
d. A two story L-shape house.

56. Looking at the elevations it is possible to see:

a. The interior cabinet elevations.
b. The front facade on the south elevation.
c. The garage windows on the west elevation.
d. The patio door on the east elevation.

57. Which of the following statements is true?

a. The roof on the house has a slope of 5" per foot.
b. The garage roof is a gable roof.
c. Eaves on the house and the garage have the same horizontal projection.
d. The roof on the house has vents extending through on the back and front halves of the house.

58. The elevation of the double top plate is found on the front elevation. (True or False)

59. The front elevation is drawn to a scale of

a. 1/8"=1'-0"
b. 1/4"=1'-0"
c. 1/2"=1'-0"
d. 3/4"=1'-0"

60. The dimension from the

a. grade to the top of the foundation is 1'-4"
b. grade to the top of foundation footings is 7'-5"
c. first floor level to the basement floor level is 8'-7 7/8"
d. bottom of the garage footing to the top of the foundation is 4'-0"

61. Which of the following statements is true?

a. The basement extends under the garage area.
b. There is footing under the patio.
c. There is an exterior entrance to the basement.
d. There are stepped footings under the house foundation.

62. Basement windows are

a. entirely below grade
b. 3 block deep in size
c. wood sash and jambs
d. wood sash and metal jambs

63. First floor windows

a. all are casement and double hung
b. all are double hung
c. all are hopper and awning
d. all are casement and fixed sash

64. The window units lettered "C" consist of

a. three sash and 2 mullion
b. three mullion and two sash
c. three sash and 2 muntin
d. three muntin and 2 sash

65. The exterior wall covering

a. shows brick veneer on all four sides of the house.
b. shows brick veneer half way up on all four sides of the house.
c. shows horizontal lap siding above brick veneer, on three sides of the house and garage.
d. shows vertical groove siding on 2 sides, the rear and the top half of the front of the house.

66. Identify the one item of information not found on the exterior elevations

a. The exact elevation of the finish floor.
b. The sub-fascia elevation at the eave line.
c. The slope of the roof.
d. The venting of the windows.

SECTIONS

67. A section is a view through a building that is exposed by

a. a schedule
b. partition
c. an easement
d. a cutting plane

68. Information found on a section may be enlarged in an additional drawing called

a. a detail
b. a schedule
c. a plot plan
d. an index

69. The house section included in the blueprints shows

a. the grade line below the level of the brick veneer.
b. the footing size at the front of the house.
c. the floor joists lap at the center bearing partition.
d. the roof bracing above the house ceiling.

70. The section primarily exposes

a. aesthetic information
b. structural information
c. topographic information
d. room finish information

71. The house section shows

a. 2" x 6" stud walls @ 24" o.c.
b. 2" x 6" stud walls @ 16" o.c.
c. 2" x 4" stud walls @ 24" o.c.
d. 2" x 4" stud walls @ 16" o.c.

72. The insulation in the walls is

a. 3 1/2" x 15" batt, friction fit
b. 3 1/2" x 15" batt with craft vapor barrier and flange
c. 3 1/2" x 15" batt with foil face
d. 3 1/2" x 23" batt with craft vapor barrier and flange

73. The center bearing partition on the first floor is located

a. directly over the bearing partition in the basement.
b. directly along side of the bearing partition in the basement.
c. offset 9" to the south of the bearing partition in the basement.
d. offset 9" to the north of the bearing partition in the basement.

74. The ceiling joists above the living room are reinforced by

a. a strong back
b. a purlin
c. a diagonal brace
d. a wood truss

75. The basement slab floor

a. rests on compact clay soil
b. rests on a compact gravel layer
c. butts against an expansion joint at the exterior wall
d. supports the center bearing partition

76. The eave line shows

a. rafter tail length of 26 13/16" before deductions
b. a 2" x 4" ribbon
c. a 1" x 4" lookout
d. a 1" x 6" sub-fascia

DETAILS

77. Detail drawings are included in a set of blueprints because enough information cannot be crowded into the space of the small scale drawings. (True or False)

78. Identify the scale that would not be suggested as normal for use in a detail.

a. 3/4 = 1'-0"
b. 1" = 1'-0"
c. 1 1/2" = 1'-0"
d. 3" = 1'-0"

79. Detail drawings aid the builder in determining the proper assembly procedure. (True or False)

80. Detail drawings may be drawn as elevation views, section views, plan views, and pictorial views. (True or False)

81. The detail at the front wall shows a flashing and watertable used to waterproof the joint where the siding meets the brick veneer. (True or False)

82. The wall section included in the blueprints indicates which one of the following

    a. 2" x 10" floor joists @ 24" o.c.
    b. 1/2" rigid foam insulation on exterior walls
    c. 11 courses of 10" concrete block
    d. 2" x 6" fascia board

83. The horizontal roof projection includes (select one):

    a. 3/8" CDX plywood roof sheathing
    b. 1" x 4" lookouts
    c. no rafter tails
    d. soffit vents

84. Brick veneer extends up to soffit or plancier board. (True or False)

85. The exterior wall indicates (select one):

    a. a single top plate
    b. plywood siding applied direct to stud
    c. 6" batt insulation
    d. 5/8" gypsum interior wall covering

86. The detail at the foundation shows the brick veneer resting on the concrete block @ 88" above the footing top. (True or False)

87. The stair detail indicates _____ for the complete stairway.

    a. 14 rises and 14 treads
    b. 14 rises and 13 treads
    c. 15 rises and 14 treads
    d. 11 rises and 10 treads

88. The total rise of the stairs is

    a. 96"
    b. 101 1/4"
    c. 102 1/2"
    d. 103 7/8"

89. Theoretically the diagonal step occurs at an elevation of _____ above the basement concrete floor.

    a. 21"
    b. 21 7/16"
    c. 22 5/16"
    d. 23 13/16"

90. The minimum allowable headroom allowed for this stairway is

    a. 6'-0"
    b. 6'-4"
    c. 6'-6"
    d. 6'-8"

35

91. The stair opening has a rough opening length of what dimension?

a. 11'- 1 1/2"
b. 11'- 1"
c. 11'- 0 3/4"
d. 11'- 0 1/2"

92. The stair detail shows a nosing on the treads of what size?

a. 1/2"
b. 3/4"
c. 1"
d. 1 1/4"

93. The stairway is shown as an

a. open riser
b. closed riser

94. If the stairway is to finish out at 3'-0", what must the rough opening be framed at?

a. 2'-11"
b. 3'-0"
c. 3'-1"
d. 3'-2"

95. The tread is supported at the front-center by

a. a stringer
b. a brace
c. a nailer
d. a riser

96. The theoretical total run of the stairs above the landing level is

a. 97 1/2"
b. 98 1/4"
c. 107 1/4"
d. 108 1/2"

97. The winding stair tread must have a normal tread width at a distance of _____" from the side of the stairway where the treads are the narrower.

a. 12"
b. 16"
c. 18"
d. 24"

98. The bathroom floor is to be

a. carpet
b. tile
c. vinyl
d. wood

99. The living room is to have walls that are finished

a. textured and painted
b. smooth and painted
c. wainscoating
d. wood paneling

100. The plancier (soffit) board is to be

a. 1/4" A-C fir plywood, painted
b. 1/4" A-D fir plywood, painted
c. 3/8" A-C fir plywood, painted
d. 3/8" A-D fir plywood, painted

CRITERIA OF ACCEPTABLE PERFORMANCE:

The student will complete the questions listed in the Conditions and Limitations with 85% accuracy. Similar questions may be devised by the instructor if desired.

1. b

2. a-6
b-7
c-1
d-8
e-9
f-10
g-5
h-4
i-2
j-3

3. a-ASTM= American Society for Testing and Measurements

b-Arch.= Architectural
c-Ftg.= Footing
d-exc.= Excavation
e-F= Fahrenheit
f-KW= Kilowatt
g-O.C.= On Center
h-perp.= Perpendicular
i-sdg.= Siding

4. a-abstract of title
b-vent (dry)
c-plywood (veneer core)
d-set back
e-collar beam
f-area way
g-building code
h-conduit
i-facade
j-hip roof

5. d

6. b

7. T

8. d

9. d

10. b

11. Foundation plan
Floor plan
Elevations (Front, rear, left and right sides)

12. 228 S.F. (13'-10"x16'-5")

13. 28'-0"x32'-0"

14. 10%

15. 15.8125 S.F.

16. 16"o.c.

17. 16'-11 7/8"

18. e

19. True

20. 14'

21. 102.231 C.F., 307.125 S.F. @ 4", 13'-6"x22'-9"

22. 10"x20"

23. 56", 4'-8"

24. c

25. a

26. (any five)
plot plan (site)
foundation plan (footing)
floor plan
elevations (exterior)
sections
details
stair section
interior elevations (cabinets, etc.)
electrical
mechanical

27. a

28. d

29. 100'-0"

30. 102'-0"

31. 30'-0"

32. $1.27

33. 3'-7 7/8"
34. True
35. False
36. c
37. False
38. c
39. a
40. 1/4" = 1'-0"
41. Detail #1, Page 6
42. True
43. True
44. False
45. False
46. a
47. c
48. False
49. c-8
50. a-1
51. b-4
52. False
53. True
54. a
55. a
56. b
57. c
58. True
59. b
60. c
61. d
62. c
63. d
64. a
65. d
66. b
67. d
68. a
69. b
70. b
71. d
72. a
73. d
74. a
75. b
76. c
77. True
78. b
79. True
80. True
81. True
82. d
83. d
84. False
85. d
86. True
87. b
88. d
89. c
90. c
91. b
92. c
93. b
94. c
95. d
96. a
97. a
98. c
99. b
100. c

TASK:

To estimate construction material quantities and costs for a residence.

CONDITIONS AND LIMITATIONS:

Given the plan for a residence (Figure 26a-n), architect's scale, catalogs with prices, and estimating sheets (figure 2a), the student will list the materials required and costs for the categories of excavating and concrete, framing, and exterior trim and interior trim, as indicated on the plan. No time limit. Notes, check sheets and/or other references may be used. Calculator may be used. No labor costs to be included.

CRITERIA OF ACCEPTABLE PERFORMANCE:

1. Estimates to include all items listed in Teacher's Estimate Key (figure 2b).

2. Total quantities, volumes and cost of each category to be accurate within 3%. Grand total cost to be within 3%.

materials estimate

COMPETENCY NO. 2
Figure 2a

Contractor SLC/LBS/ESU-6
Estimator
Date
Page No. 1 of
Job Name EXP HOUSE # 1982

Perimeter of exterior stud wall
Perimeter of exterior foundation wall
Interior lineal feet of walls (house)
Lineal feet of garage walls
Square footage of house
Total lineal feet of door opening

# Pieces	Size	Length	Description	Total	Units	Unit Price	Total Price

SCC M0157

# Pieces	Size	Length	Description	Total	Units	Unit Price	Total Price

materials estimate

COMPETENCY NO. 2
Figure 2b
Teacher Key

Contractor SCC / LBS / ESU-6
Estimator L. KNESS
Date 9-27-82
Page No. 1 of 9
Job Name EXP. HOUSE #1982

Perimeter of exterior stud wall 120 L.F.
Perimeter of exterior foundation wall 148 L.F.
Interior lineal feet of walls (house) 115 L.F.
Lineal feet of garage walls 52 L.F.
Square footage of house 896 ; GARAGE 336
Total lineal feet of door opening 33 L.F.

# Pieces	Size	Length	Description	Total	Units	Unit Price	Total Price
			CONC. AND EXCAVATION				
			CONC. FOOTING				
5.18	CU.YDS.		HOUSE (.833x1.67x120÷27)	5.18	CU.YDS.		
2.89	CU.YDS.		GARAGE (.5x3x52÷27)	2.89	CU.YDS.		
33	CU.YDS.		PORCH (.5x3x3x2÷27)	.33	CU.YDS.		
.35	CU.YDS.		SIDEWALK (.33x3x9.5÷27)	.35	CU.YDS.		
1.173	CU.YDS.		REAR SLAB (.33x8x12÷27)	1.173	CU.YDS.		
6.013	CU.YDS.		DRIVEWAY (.33x12x41÷27)	6.013	CU.YDS.		
.825	CU.YDS.		DRIVEWAY APRON (.33x4.5x15÷27)	.825	CU.YDS.		
1.548	CU.YDS.		CTR. BRNG. (.83x1.67x30.17÷27)	1.548	CU.YDS.		
			REINF. BAR.				
12	#4 (½")	20'	HOUSE @ 240 L.F.	240	L.F.		
			BASEMENT FLOOR - CONC.				
9.587	CU.YDS.		30.17x26x.33÷27	9.587	CU.YDS.		
			BASEMENT FLOOR - FILL SAND				
4.568	CU.YDS.		29.5x12.67x33÷27	4.568	CU.YDS.		
785	S.FT.		W.W. MESH @ 6x6 #10/10	785	S.F.		
			GARAGE FLOOR - CONC.				
3.74	CU.YDS		13.5x22.67x33÷27	3.74	CU.YDS.		
			GARAGE FLOOR - FILL SAND				
3.74	CU.YDS.		13.5x22.67x.33÷27	3.74	CU.YDS.		
			BASEMENT CTR. BRNG. PAR.				
			4"x4"x16" CONC. BLK.				
20½	4"x4"	16"	27'-5" ÷ 16" = 20.488	21	EACH		

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# Pieces	Size	Length	Description	Total	Units	Unit Price	Total Price
			CONC. BLOCK				
46	10"-L CORNER	16"	10" L-CORNER = 11.5x4	46	EACH		
			6"- 2 CORE STRETCHERS				
20	6"x8"	16"	32÷1.33=24-4=20	20	EACH		
			10"- 2 CORE STRECHER				
			120÷1.33=90.22x12=	1092	- 24 BRICK LARGE AND		
					26 FULL @ WINDOW =		
				1041	EACH		
10	10"x8"	8"	10"- ½ JAMB BLOCK	10	EACH		
16	10"x8"	16"	10"- FULL JAMB BLOCK				
4	6"x8"	16"	6"- FULL JAMB BLOCK				
			MORTAR - WALLS				
87	CU.FT.		FOR 1158 CONC. BLKS.	87	CU.FT.		
15	CU.FT.		FOR 950 BRICK	15	CU.FT.		
			WATERPROOFING				
			PARGE COAT				
27	CU.FT.		AREA 88"x120'=7.33x120=879.6	27	CU.FT.		
			ASPHALT				
880	S.F.		880 ft AREA	880	S.F.		
			POLYETHELENE VAPOR BARRIER				
960	S.F.		8'x120'=960 ft @ 6 MIL.	960	S.F.		
			FRAME MEMBERS				
5	18"	42"	AREA WALLS - CORR METAL				
			FOUNDATION SILL - NOTE	120	L.F.		
2	2x6	12'					
2	2x6	14'					
2	2x6	16'					
2	2x6	18'					
16	½"	8"	ANCHOR BOLTS	16	EACH		
1	6"	120'	SILL SEALER	1	EACH		

# Pieces	Size	Length	Description	Total	Units	Unit Price	Total Price
			BASEMENT CNTR. STUD WALL				
25	2"x4"	92 5/8"	PRECUT STUDS	200	L.F.		
6	2"x4"	16'	PLATES	96	L.F.		
4	2"x4"	92 5/8"	STUDS UNDER STAIRS	32	L.F.		
2	2"x4"	12'	PLATES AT STAIRS	24	L.F.		
			FLOOR JOISTS				
			BUTTED AND SPLICED @ CTR.				
23	2"x10"	14'	JOISTS @ REAR ½ OF HOUSE	322	L.F.		
27	2"x10"	14'	JOISTS @ FRONT ½ OF HOUSE	378	L.F.		
1	2"x10"	10'	HEADER AT STAIR OPENING	10	L.F.		
4	2"x10"	16'	BOX HEADER	64	L.F.		
			WOOD CROSS BRIDGING				
6	1"x6"	12'	#2 PINE	72	L.F.		
28	½"x4'x8'		PLY. SHEATHING X-16 CTR	896	S.F.		
			EXTERIOR WALL PLATES - HOUSE				
6	2"x4"	12'		6	EACH		
6	2"x4"	14'		6	EACH		
6	2"x4"	16'		6	EACH		
6	2"x4"	18'		6	EACH		
			EXTERIOR WALL STUDS - HOUSE				
110	2"x4"	92 5/8"	PRECUT STUDS	880	L.F.		
	2"x4"		EXT. WALL TRIMMERS	98	L.F.		
			INTERIOR WALL PLATES - HOUSE				
18	2"x4"	12'	216 L.F.	216	L.F.		
6	2"x4"	16'	96 L.F.	96	L.F.		
			INTERIOR WALL STUDS - HOUSE				
8	2"x4"	14'	1280 L.F.	1280	L.F.		
			GARAGE WALLS - SILL PLATE				
1	2"x6"	8'	EAST WALL 8 L.F.	8	L.F.		
1	2"x6"	10'	SOUTH WALL 10 L.F.	10	L.F.		
1	2"x6"	12'	NORTH WALL 12 L.F.	12	L.F.		
1	2"x6"	16'	EAST WALL 16 L.F.	16	L.F.		

# Pieces	Size	Length	Description	Total	Units	Unit Price	Total Price
			GARAGE PLATES				
3	2"x4"	8'	EAST WALL	24	L.F.		
6	2"x4"	14'	NORTH AND SOUTH WALL	84	L.F.		
3	2"x4"	16'	EAST WALL	48	L.F.		
			GARAGE WALL STUDS				
43	2"x4"	92⅝	PRECUT STUDS	344	L.F.		
4	2"x4"	14'	WALL TRIMMERS	56	L.F.		
			EXT. WALL HEADERS - HOUSE				
1	2"x12"	6'		6	L.F.		
3	2"x12"	8'		24	L.F.		
1	2"x12"	10'		10	L.F.		
1	2"x12"	12'		12'	L.F.		
			EXTERIOR WALL HEADERS - GARAGE				
1	2"x12"	6'	NORTH WALL	6	L.F.		
3	2"x12"	10'	EAST + SOUTH WALL	30	L.F.		
			INTERIOR HEADERS HOUSE				
2	2"x4"	12'		24	L.F.		
2	2"x4"	14'		28	L.F.		
2	½"x4'	8'	CDX PLY. HEADER SPACERS	64	S.F.		
			OPTION #1 BEAM @ LIVINGROOM				
			KITCHEN - FRAMED @ CEILING JST. LEVEL				
2	2"x8"	8'		*16	L.F.		
1	2"x10"	8'		*8	L.F.		
			OPTION #2 HEADER @				
			LIVINGROOM - KITCHEN				
2	2"x12"	8'		*16	L.F.		
			FLOOR JOISTS				
			(LAPPED @ GR. BEING WALL)				
53	2"x10"	16'	FRONT + REAR ½ OF HOUSE	848	L.F.		
1	2"x10"	6'	TAIL JOISTS @ STAIRS	6	L.F.		

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# Pieces	Size	Length	Description	Total	Units	Unit Price	Total Price
			CEILING JOISTS - GARAGE				
22	2"x6"	12'	BUTTED + STAGGERED @ CTR.	264	L.F.		
			ROOF FRAME				
			COMMONS @ PRIMARY RIDGE				
12	2"x6"	18'	COMMON LENGTH @ 16'-10 3/8"	216	L.F.		
			COMMONS @ SECONDARY RIDGE				
22	2"x6"	16'	COMMON LENGTH @ 14'-9 1/8"	352	L.F.		
18	2"x6"	16'	HIP JACKS @ GARAGE END	288	L.F.		
22	2"x6"	18'	HIP JACKS @ HOUSE WEST	396	L.F.		
			HIP RAFTERS				
3	2"x8"	24'	HOUSE @ 23'-3 1/8"	72	L.F.		
3	2"x8"	22'	GARAGE @ 20'-4 3/16"	66	L.F.		
			RIDGE BOARD				
1	2"x8"	16'	SECONDARY RIDGE	16	L.F.		
1	2"x8"	8'	PRIMARY RIDGE + SHORT HIP	8	L.F.		
			ROOF SUBFASCIA				
3	2"x6"	14'		42	L.F.		
2	2"x6"	16'		32	L.F.		
5	2"x6"	18'		90	L.F.		
			ROOF SHEATHING + FELT PAPER				
42	1/2"x4'	8'	CDX - 32-16 SHEATHING	1344	S.F.		
4	36"		15# FELT PAPER	4	ROLLS		
			EXTERIOR TRIM				
			ROOF - FASCIA BOARD				
9	1"x8"	20	REDWOOD FASCIA	180	L.F.		
			ROOF VENTS				
5	8"x8"		SCREENED ROOF VENTS	5	EACH		

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# Pieces	Size	Length	Description	Total	Units	Unit Price	Total Price
			BOX CORNICE				
			RIBBON OR NAILER, #2 PINE				
9	1"x4"	16'		144	L.F.		
1	1"x4"	8'		8	L.F.		
			LOOKOUTS @ 24" O.C.				
11	2"x4"	12'	#2 AND BTR. S.P.F.	132	L.F.		
1	2"x4"	16'	#2 AND BTR. S.P.F.	16	L.F.		
			SOFFIT				
10	3/8"x4'	8'	A-C FIR PLYWOOD	320	S.F.		
			ROOF COVERING - 240#				
13½	SQUARES	12'x36"	ASPHALT SHINGLES, 3 TAB	13½	SQUARES		
1½	SQUARES	12'x36"	160 L.F. HIP + RIDGE CAP	1½	SQUARES		
1	SQUARE	12'x36"	STARTER COURSE	1	SQUARES		
4	SQUARES	12'x36"	WASTE @ HIP + VALLEY	4	SQUARES		
			VALLEY FLASHING				
1	20"	24'	28 GA. GALVANIZED STEEL	1	EACH		
			BRICK VENEER @ FRONT				
950			COMMON RED BRICK 15LB	950	EACH		
150			ROWLOCK	150	EACH		
60			WALL TIES	60	EACH		
			EXTERIOR WALL COVERINGS				
40	3/4"x4'	9'	RIGID INSULATION "FOAMULAR" R-6.5	1440	S.F.		
35	5/8"x4'	8'	PLYWOOD SIDING V-GROOVE REV. BRD. AND BATTEN	1120	S.F.		
12	REG.		TUBES LATEX CAULK	12	EACH		
6	GALLONS		OIL PRIMER PAINT FOR	6	GALLONS		
			SIDING, SOFFIT, FASCIA,				
			WINDOW AND DOOR FRAMES				
6	GALLONS		LATEX HOUSE PAINT	6	GALLONS		

# Pieces	Size	Length	Description	Total	Units	Unit Price	Total Price
			DRYWALL - ½" GYPSUM				
3600	S.F.		½" GYPSUM - WALLS	3600	S.F.		
900	S.F.		½" GYPSUM - CEILING	900	S.F.		
200	S.F.		⅝" GYPSUM GARAGE WALL @ HOUSE (FIRE WALL)	200	S.F.		
311	S.F.		⅝" GYPSUM - GARAGE CEILING	311	S.F.		
			INTERIOR TRIM				
			DOORS				
1	3'-0"x6'-8"		1¾" WOOD FLUSH DOOR - H.C. OAK	1	EACH		
2	2'-8"x6'-8"		1¾" WOOD DOOR - 30 M - 3 LITE FIR	2	EACH		
1	5'-0"x6'-8"		1¾" WOOD PATIO - ATRIUM HINGED PAIR	1	EACH		
2	3'-0"x6'-8"		1⅜" WOOD BI-FOLD - 2 PO - RED OAK FINISH	2	EACH		
2	2'-8"x6'-8"		1⅜" WOOD FLUSH - H.C. RED OAK	2	EACH		
2	2'-4"x6'-8"		" " "	2	EACH		
1	1'-6"x6'-8"		" " "	1	EACH		
1	4'-0"x6'-8"		1⅜" WOOD BI-FOLD - 4 PO - RED OAK	1	EACH		
1	9'-0"x7'-0"		WOOD - FIR 5 PANEL OVAL RAINOR 2 LITE	1	EACH		
			ALL HARDWARE FOR BI-FOLD DOORS TO BE INCLUDED				
			DOOR JAMBS				
			EXTERIOR, W/SILL & BRICKMOLD				
1	2'-8"x6'-9"		PINE, 5¼", 1¾"	1	EACH		
1	2'-8"x6'-9"		PINE, 4⅝", 1¾"	1	EACH		
1	3'-0"x6'-9"		PINE, 5¼", 1¾"	1	EACH		
1	9'-0"x7'-0"		5¼" - PINE JAMB, CASING & BRICKMOLD + STOP	1	EACH		
			INTERIOR				
2	2'-8"x6'-9"		RED OAK @ 4⅝"	2	EACH		
2	2'-4"x6'-9"		" " "	2	EACH		
1	1'-6"x6'-9"		" " "	1	EACH		
2	3'-0"x6'-9"		RED OAK BI-FOLD JAMB @ 4⅝"	2	EACH		
1	4'-0"x6'-9"		" " "	1	EACH		
			DOOR STOP				
8	1⅜"	14'	HEXTONE - RED OAK STOP (SIDE JAMB)	14	L.F.		
2	1⅜"	12'	HEXTONE - RED OAK STOP (HEAD JAMB)	12	L.F.		

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# Pieces	Size	Length	Description	Total	Units	Unit Price	Total Price
			CASING				
			DOORS				
19	2¼"	14'	HERITAGE - R. OAK (SIDES)				
4	2¼"	12'	" " (HEADS)				
3	2¼"	8'	" " "				
2	2¼"	10'					
			WINDOWS				
2	SIDES		FOR ANDERSEN WX1N3	28	L.F.		
2	SIDES		" " W2N3	40	L.F.		
1	SIDE		" " W3N5	24	L.F.		
			CLOSET TRIM				
1	1¾"	10'	CLOSET POLE	10	L.F.		
1	1⅜"	8'	" "	8	L.F.		
1	1"x4"	12'	C.W.P. CLOSET RIBBON	12	L.F.		
4	1"x4"	10'	" " "	40	L.F.		
3	12"		SHELF & POLE SUPPORTS	3	EACH		
3	SETS		POLE SOCKETS	3	SETS		
1	¾"x4'	8'	AB FIR PLYWOOD SHELF	32	S.F.		
			STAIRS				
2	2"x12"	12'	STRINGERS	24	L.F.		
1	1"x10"	12'	C.W.P. KICKBOARD	12	L.F.		
1	1"x10"	6'	" "	6	L.F.		
2	2"x12"	18'	TREADS	36	L.F.		
2	1"x8"	12'	RISERS, #2 PINE	24	L.F.		
1	1"x8"	18'	" " "	18	L.F.		
3	2"x4"	92⅝"	STUDS	3	EACH		
1	2"x4"	18'	LANDING FRAME - PLATES	18	L.F.		
1	2"x6"	6'	STRINGER NAILER	6	L.F.		
1	¾"x3'	4'	LANDING	2	L.F.		

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# Pieces	Size	Length	Description	Total	Units	Unit Price	Total Price
			HARDWARE				
			LOCKSETS				
4	2 3/8" BACKSET		KEYED ENTRY, KA	4	EACH		
3	2 3/8" BACKSET		PRIVACY - BEDROOM/BATH	3	EACH		
3		3"	SPRING DOOR STOPPERS	3	EACH		
1	2 3/8" BACKSET		PASSAGE LOCKSETS	1	EACH		
8	3 1/2" x 3 1/2"		ROUND CORNER BUTTS	8	PR.		
3	4" x 4"		" " "	3	PR.		
			NAILS - ACCESSORIES				
150#	16d		BOX NAILS - FRAME	150	LBS.		
75#	8d		BOX NAILS - FRAME + SHEATHING	75	"		
25#	2 1/4"		GALV. ROOF NAILS - PANELETTE	25	"		
75#	16d		GALV. BOX - SIDING	75	"		
20#	5d		" " - SOFFIT	20	"		
5#	8d		" " - FASCIA	5	"		
50#	8d		COOLER NAILS - UNDERLAYMENT	50	"		
20#	6d		FINISH NAILS - TRIM	20	"		
15#	4d		" " "	15	"		
30#	1 1/2"		DRYWALL NAILS	30	"		
700	L.F.		" TAPE	700	L.F.		
7	5 GAL.		JOINT COMPOUND	7	5-GAL.		
			GUTTERS				
170	L.F.		GALV. STEEL GUTTERS	170	L.F.		
5		10'	DOWNSPOUTS - STRAIGHT RUN	50	L.F.		
2		10'	" - INCLINE RUN	20	L.F.		
15			A-ELBOWS	15	EACH		
5		36"	SPLASH BLOCKS	5			
10			PIPE STRAPS	10			
12			SLIP JOINT CONNECTORS	12			
5			OUT-SIDE MITERED CORNERS	5			
1			INSIDE - " "	1			
5			"D" END PIECES W/ OPENINGS	5			
42			FERRULES + GUTTER SPIKES	42			
			CABINETS				
14		L.F.	WALL + BASE KIT CAB.	14	L.F.		
6		L.F.	BASE BATH CABINETS	6	L.F.		

TASK:

To place and finish a concrete slab.

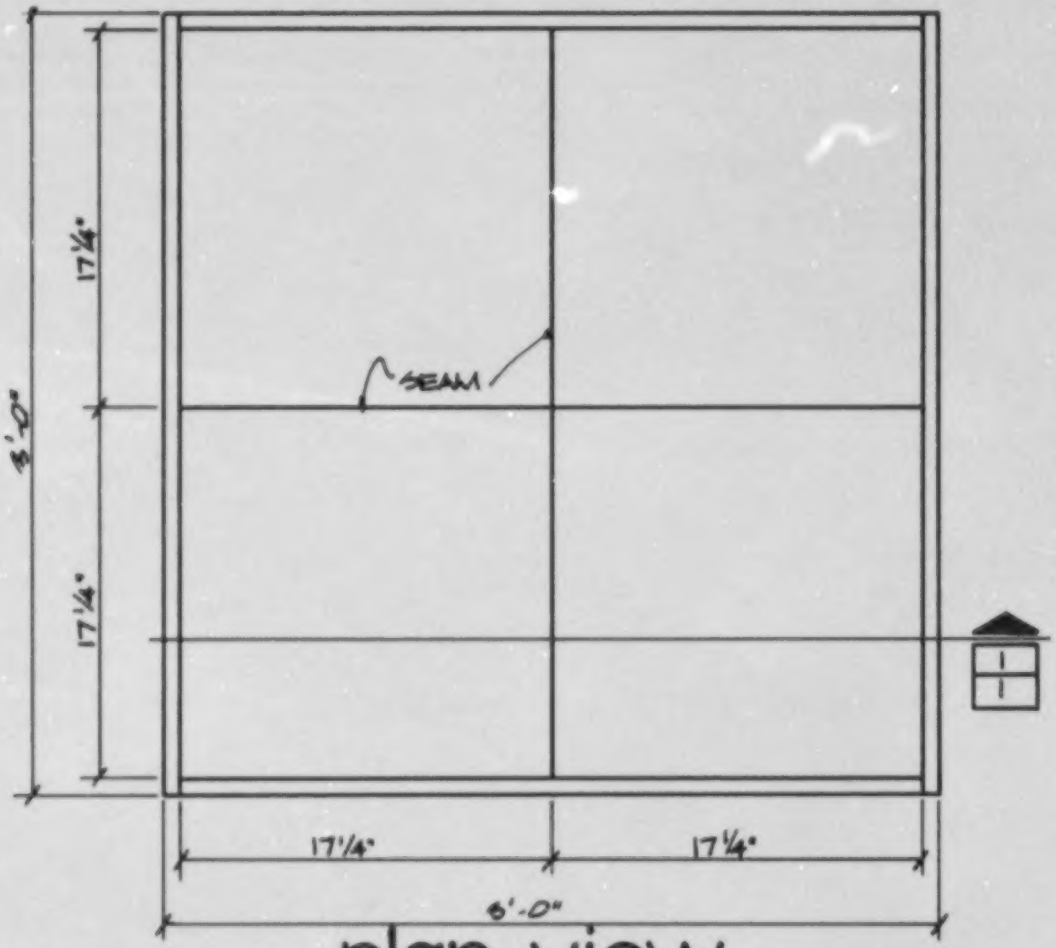
CONDITIONS AND LIMITATIONS:

Given the proper tools and materials (including a float, cement masons trowel, form material and mesh), the student will build a form (see figure 3a), reinforce, place, screed, float, trowel, edge and seam a concrete slab. The slab will be reinforced with 6" x 6" welded wire mesh, and seamed as shown. No time limit. References may not be used.

CRITERIA OF ACCEPTABLE PERFORMANCE:

1. Form according to figure #3a or larger.
2. Slab to be flat, free of depressions and irregularities.
3. Slab to be square, within 1/8" @ diagonal measure.
4. Surface to be troweled, edged and seamed smooth, free of tool marks.
5. Mesh to be embedded in concrete, not exposed on top or bottom surfaces or edges.
6. Area free of excess concrete.
7. Tools free of concrete and rust.

CONCRETE SLAB-FLATWORK



plan view
SCALE: 1½" = 1'——0"

1section
SCALE: N.T.S.

DR. BY: JAY HOOD 3/27/82

TASK:

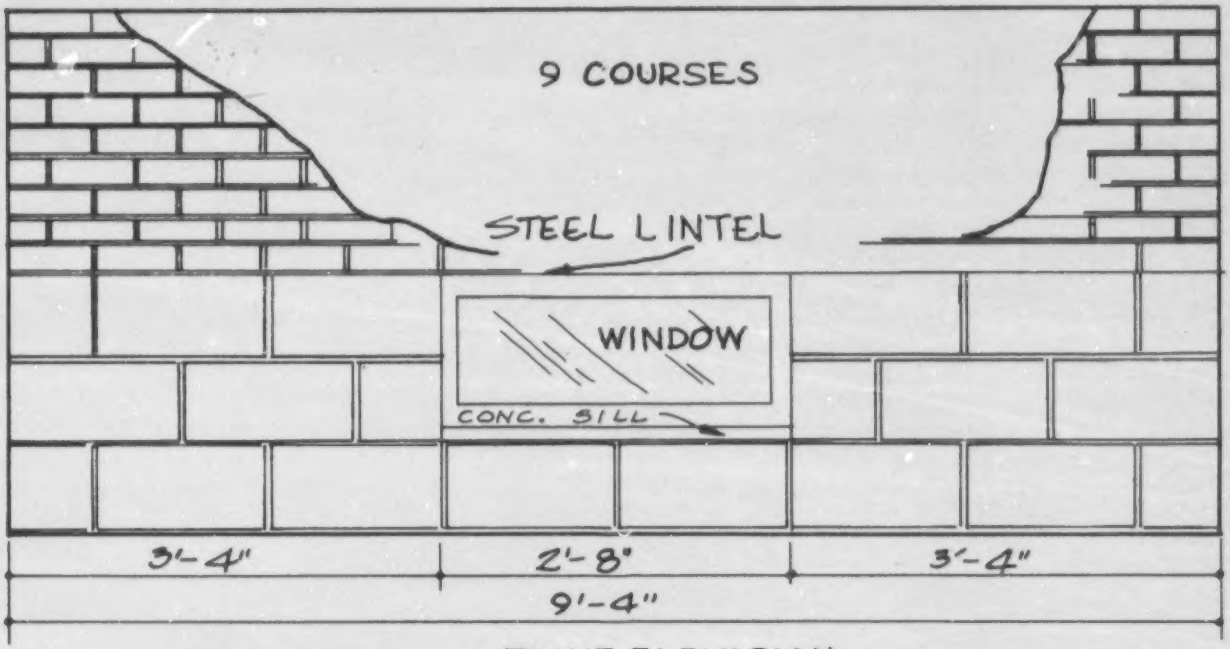
To lay concrete block and facing brick

CONDITIONS AND LIMITATIONS:

Given the proper tools (including a 4' masons level) and materials, (including 8" min. concrete stretchers, half blocks, corner, sash, half sash blocks, standard facing brick of 2 2/3" x 4" x 8" nominal size, lime, sand, mortar and brick ties), the student will lay up a wall according to the plan (Figure 4a). Exterior joints of brick and both interior and exterior joints of block to be jointed. Brick ties properly located. Area and tools to be cleaned. References may not be used. No time limit.

CRITERIA OF ACCEPTABLE PERFORMANCE:

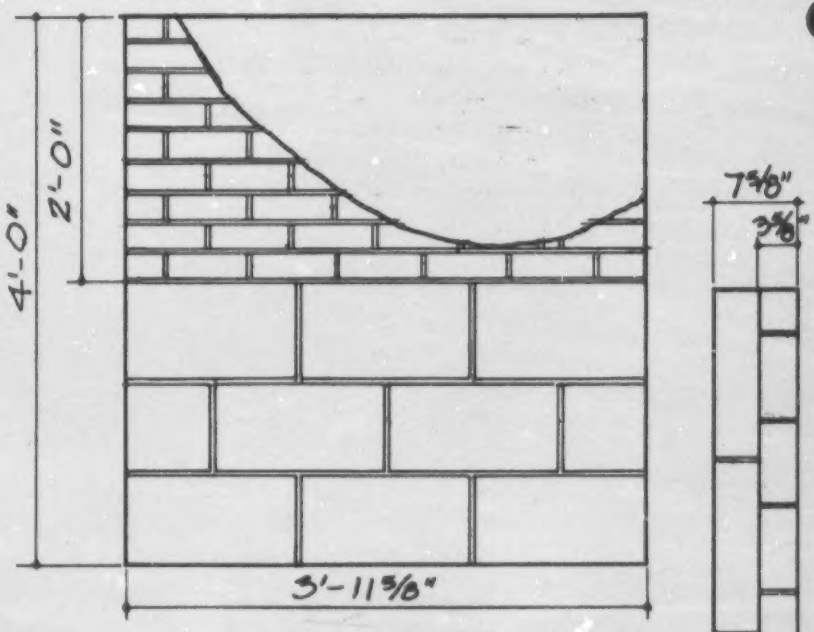
1. Walls to be according to plan (Figure 4a).
2. Placement of block/brick types and usage according to design on plan. (Figure 4a)
3. Walls to be level and plumb within 1/8" per 4'.
4. Measurements to be within 1/8" in length or height.
5. Joints to be ±3/8" with no voids.
6. Exterior joints of brick, interior and exterior joints of blocks to be jointed and cross brushed when mortar is thumbprint hard.
7. Concave jointer to be used on all jointing.
8. Area free of excess mortar and materials.
9. Tools free of mortar and rust.



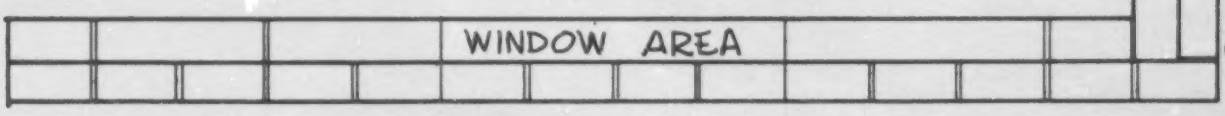
FRONT ELEVATION

NOTES:

1. Block is 8"x8"x16" @ 3 courses.
2. Brick is 2 2/3"x4"x8" @ 9 courses.
3. Steel lintel to carry brick over window opening.
4. Window to have concrete sill sloped to exterior and interior.
5. Window to be spaced at center line of wall if wood, and jamb block groove if metal.



END ELEVATION



PLAN VIEW

TASK:

To design and layout an electrical system.

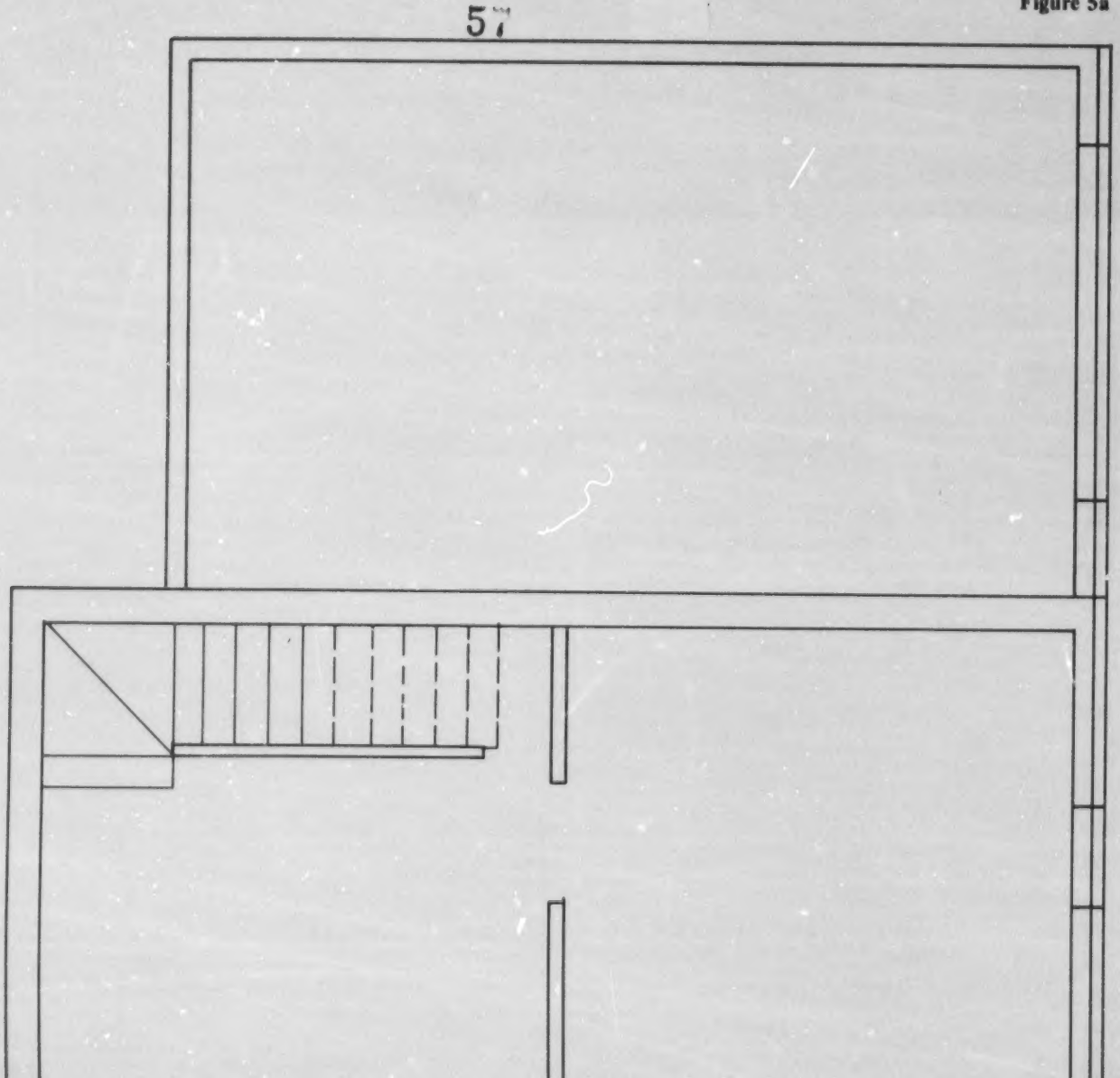
CONDITIONS AND LIMITATIONS:

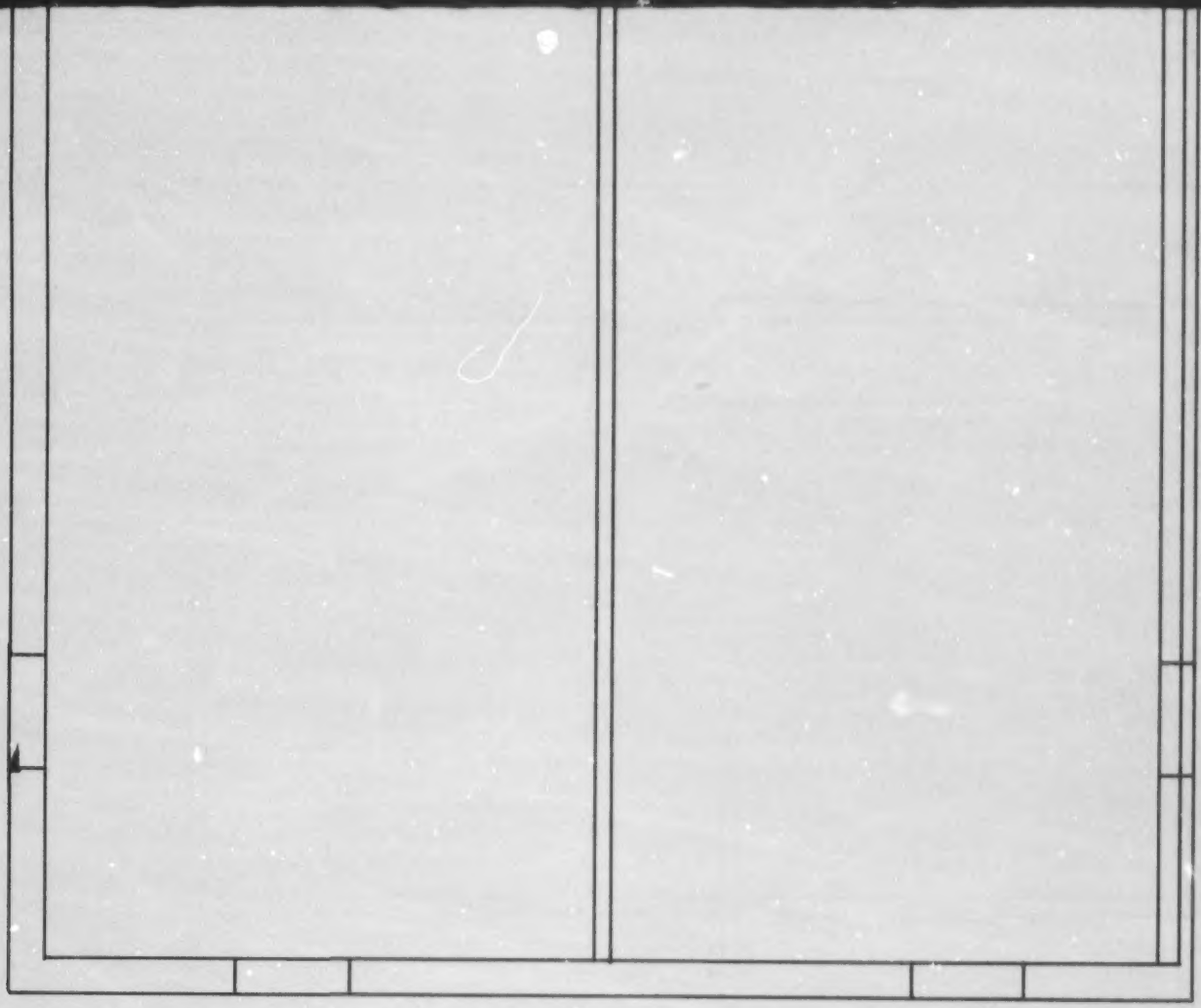
Given the plan for a residence (Fig. 5a, 5b), current NEC book, listing of electrical symbols (Figure 5c), and Information Sheets (Figure 5d), the student will draw a complete electrical system, color-coding each separate circuit with a different color. Location of the entrance panel, all switches, fixtures, receptacles, applicances and utilities will be identified by the use of symbols. Proper load requirements followed. No time limit. References may be used.

CRITERIA OF ACCEPTABLE PERFORMANCE:

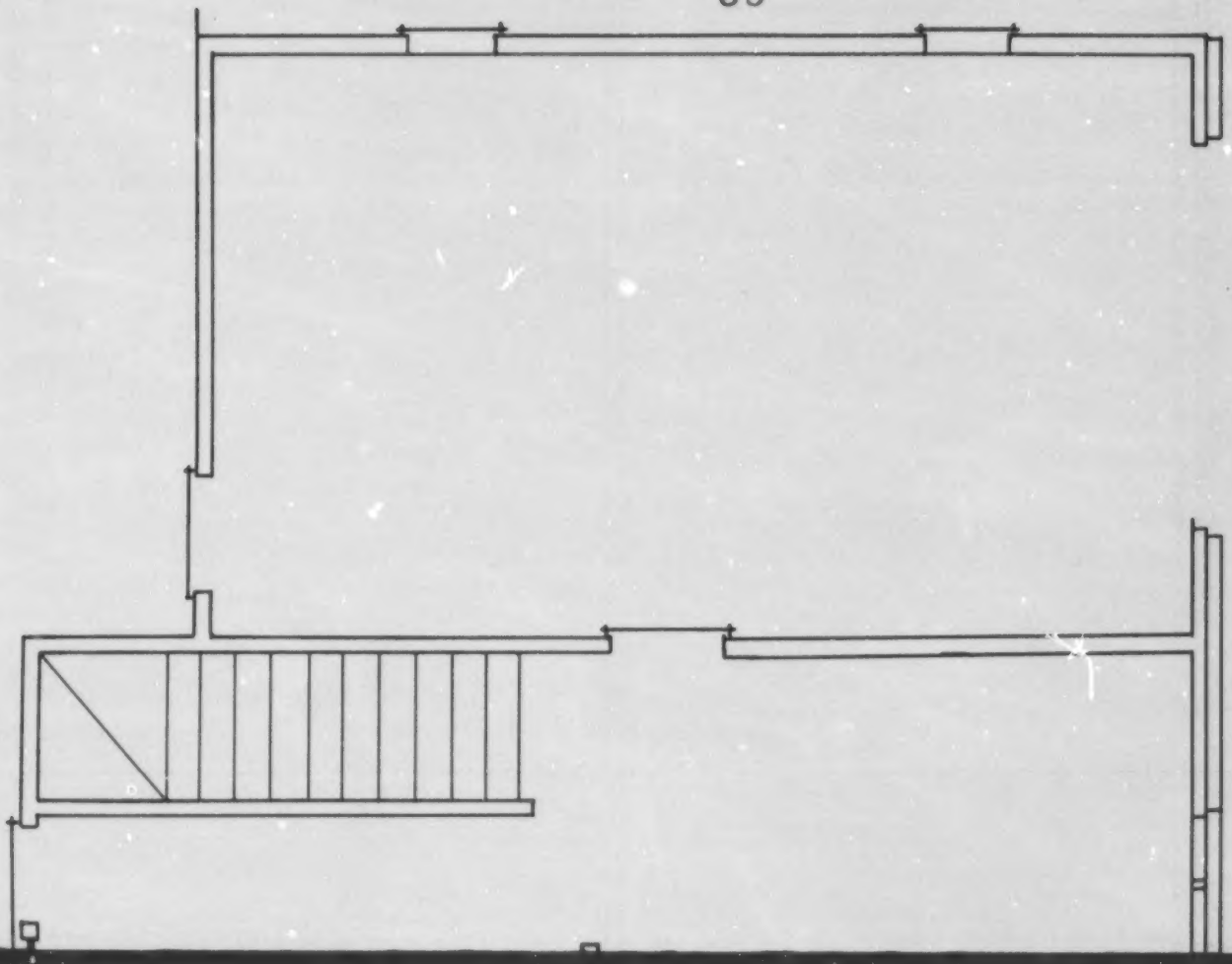
1. Correct symbols used according to electrical symbol key (Figure 5c) and ANSI Standard Y- 32.9 - 1972.
2. Entrance panel and all items listed in information sheet (Figure 5d) to be included.
3. Circuits to comply with NEC section 210, 220 and Art. 370.
4. Individual circuits color coded with different colors.
5. Loop originates at point requiring least amount of wire to entrance panel.
6. Each circuit identified by a numbering system.
7. Loads calculated according to NEC Chapter 9, example 1.
8. All criteria to correspond to suggested teacher's key plan. (Figure 26n and 26o)

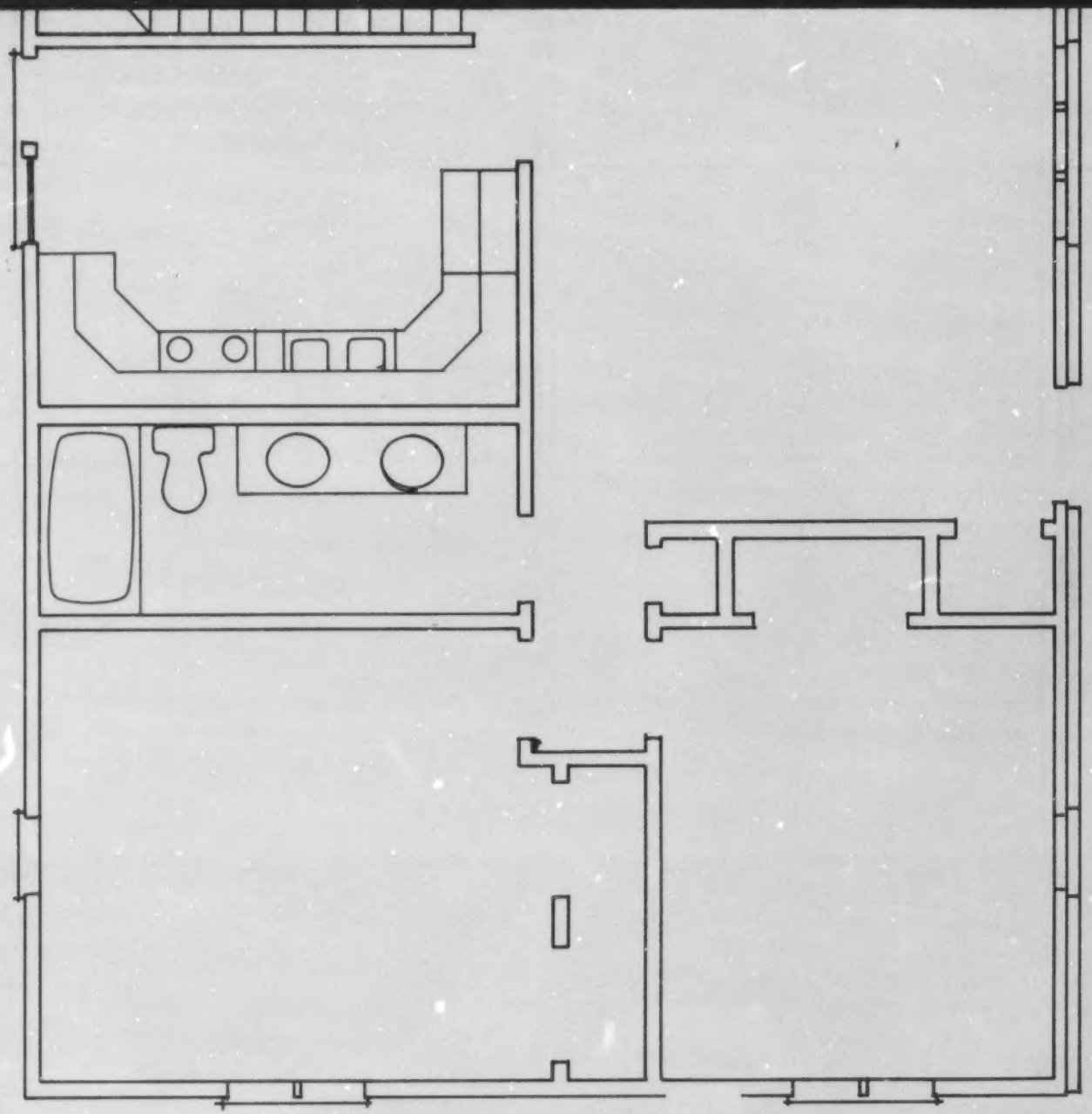
Figure 5a



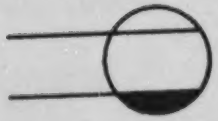


COMPETENCY NO. 5
Figure 5b

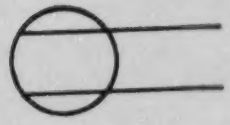




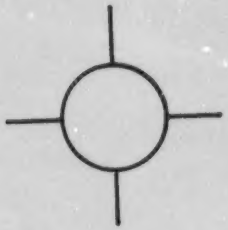
Electrical Symbols



Duplex Convenience Outlet-Split Wired

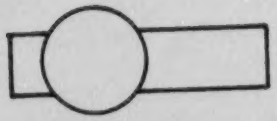


Duplex Convenience Outlet



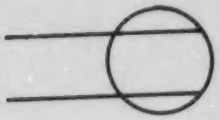
Ceiling Light Outlet

Recessed Ceiling Light



Fluorescent Light

Television Outlet



Weatherproof Duplex Outlet

Range

Special-Purpose Outlet

S

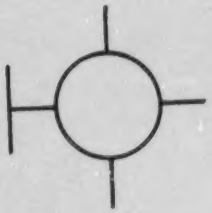
Single-Pole Switch

S_3

Three-Way Switch

S_4

Four-Way Switch



Wall Mounted Light Outlet

S_W

Weatherproof Switch

COMPETENCY NO. 5
Figure 5c

INFORMATION SHEET

A. Planning the convenience outlets

1. Living room and bedrooms

   a. One or more duplex outlets controlled by three-way wall switches at front door and garage entrance door.
   b. One or more ceiling lights controlled by wall switch (grounding type) in bedrooms.
   c. Duplex outlets spaced 12 feet apart maximum around wall so no point is over six feet away from outlet, any wall space two feet or greater shall require an outlet.

B. Kitchen

1. One or more ceiling lights, controlled by 3-way wall switch, one at back door and one at exit to living room.
2. One ceiling light or wall light located over sink, wall switch controlled.
3. Special purpose outlets for range, disposal, and as needed on items over 1/3 hp. G.D. to be switched by wall switch above counter top.
4. Install a duplex receptacle for any countertop over 12" wide. For running countertop install a duplex receptacle every 3 feet.
5. Range hood to include fan and light.
6. At least one duplex outlet (grounding type) for each usable wall space not previously used.

C. Basement

1. One or more ceiling outlet(s) controlled by wall switch
2. Duplex outlets located for miscellaneous uses
   (NOTE: Three-prong grounding outlets are required.)
3. Special purpose outlets for washer and dryer
4. Furnace will be a special purpose outlet

D. Bathrooms

1. One or more lighting outlet(s) located at mirror, controlled by wall switch
2. Duplex outlet required at both ends of sink basin (GFIC)
3. Vent to be installed in ceiling in tub area, wall switch controlled

E. Halls

1. One ceiling outlet, controlled by wall switches
2. One duplex outlet needed for each 12' of hall space
3. One smoke detector (SD)

F. Stairways and Closets

1. One lighting outlet for each bedroom closet, controlled by wall switch, pull chain or door switch. Light to be recessed in ceiling.
2. Stairway light to be fed from basement circuit and controlled from top and bottom of stairs by three-way switches.

G. Exterior Entrances

1. One lighting outlet at back and two at front of house, controlled by indoor switch.
2. One single weatherproof outlet located at front and one at back of house (GFIC).

H. Garage

1. One overhead light, wall switch controlled
2. One duplex receptacle (GFIC)
3. One duplex receptacle for garage door opener

I. Attic

1. One light on pull chain

TASK:

To estimate electrical material:

CONDITIONS AND LIMITATIONS:

Given a complete wiring plan for a residence correctly completed in Competency No. 5, (Figure 5a, 5b), current NEC book, catalogs with prices and estimate sheets (Figure 6a), the student will list the materials and total material costs for wiring the residence on the plan, from, and including, the service entrance panel. All fixtures, receptacles, switches, etc., to be included. Material must be itemized on estimate sheet with quantities, unit prices and totals. Labor costs not included. No time limit. References may be used. Calculator may be used.

CRITERIA OF ACCEPTABLE PERFORMANCE:

1. Estimate to include all electrical materials and quantities shown on the plan and listed in teachers key (Figure 6b).
2. Prices to be according to catalogs supplied and extended with ± 3% accuracy.
3. Total cost to be accurate within ± 3%.

electrical materials estimate

COMPETENCY NO. 6
Figure 6a

Contractor 2nd/LPO/EXO-6

Estimator _____

Date _____

Page No. 1 of _____

Job Name Ext. House #1982

# Pieces	Size	Length	Description	Total	Units	Unit Price	Total Price

SCC M0157

# Pieces	Size	Length	Description	Total	Units	Unit Price	Total Price

electrical materials estimate

COMPETENCY NO. 6
Figure 6b
Teacher Key

Contractor SLL/LPS/ESU-6

Estimator _____

Date _____

Page No. 1 of _____

Job Name EXP. HOUSE #1982

# Pieces	Size	Length	Description	Total	Units	Unit Price	Total Price
1		20 Ft	10 - 3 WGNM	20			
1		250 Ft	12 - 3 WGNM	250			
5		250 Ft	12 - 2 WGNM	1250 Ft			
1		50 Ft.	8 - 3 WGNM	50 Ft.			
22			IVORY GROUDED OUTLET RECEPT.				
22			OUTLET COVER PLATES				
15			SINGLE POLE SWITCH				
15			SINGLE SWITCH COVER PLATE				
8			3 - WAY SWITCHES				
4			DOUBLE SWITCH COVER PLATE				
5			GFI RECEPTACLE				
2			WEATHER PROOF COVERS				
38			SINGLE OUTLET BOXES				
4			DOUBLE OUTLET BOXES				
2	1/2" x 10'		THIN WALL CONDUIT				
6			CONDUIT CONNECTORS				
1			CLOTHES DRYER RECEPT.				
1			RANGE RECEPTACLE				
1			200 AMP SERVICE PANEL				
2			PORCH LIGHTS OUTSIDE				
1			GARAGE LIGHT OUTSIDE				
4			2-BULB CEILING LIGHTS				
1			BATHROOM VANITY LIGHT				
1			KITCHEN LIGHT OVER SINK				
1			BATHROOM EXHAUST FAN				
2			PORCELAIN FIXTURES W/ PULL SWITCH				
15	4"		CEILING OUTLET BOXES				
1	100		WIRE STAPLES				
2	50		ASSORTED WIRE NUTS				
1	2"	2 Ft	EMT CONDUIT	2 Ft.			
1	2"		EMT CONNECTOR				

SCC M0157

# Pieces	Size	Length	Description	Total	Units	Unit Price	Total Price
1	2"		PLASTIC BUSHING				
1	16V		TRANSFORMER				
2			DOOR BELL BUTTONS				
1		100 Ft.	DOOR BELL WIRE	100 Ft.			
2			4"sq x 2⅛" 1" KO BOX				
1			DRYER RECEPT. COVER				
1			RANGE RECEPT. COVER				
2			4" x 2" x 2⅛" BOX				
2			20 AMP DUPLEX RECEPT.				
3			PORCELAIN FIXTURES				
5			RECESSED LIGHT FIXTURES				
1			SMOKE DETECTOR				
1			DOOR BELL CHIMES				
1			SINGLE SWITCH BOX COVER UNIT				
1	30"		RANGE HOOD				

TASK:

To install a service entrance panel.

CONDITIONS AND LIMITATIONS:

Given a poured concrete wall, block wall or basement wall mock-up, proper tools and supplies (including a service entrance panel [breaker type], electrical floor plan [Figure 26m & 26n], driven ground rod and assortment of fasteners), the student will determine the location of the box, bore needed holes, select fasteners, install box and securely ground. No time limit. Current National Electrical Code (NEC) book may be used.

CRITERIA OF ACCEPTABLE PERFORMANCE:

1. Box location according to plan and NEC 230-72(c).
2. Hole for entrance wire according to NEC 230-201(b) (1/4" tolerance).
3. Fastener used to be tamp-in, screw anchor, toggle bolt, or stud gun, with at least 1" penetration.
4. Entrance pipe connected with locking nut and insulated bushing according to NEC 345-15.

TASK:

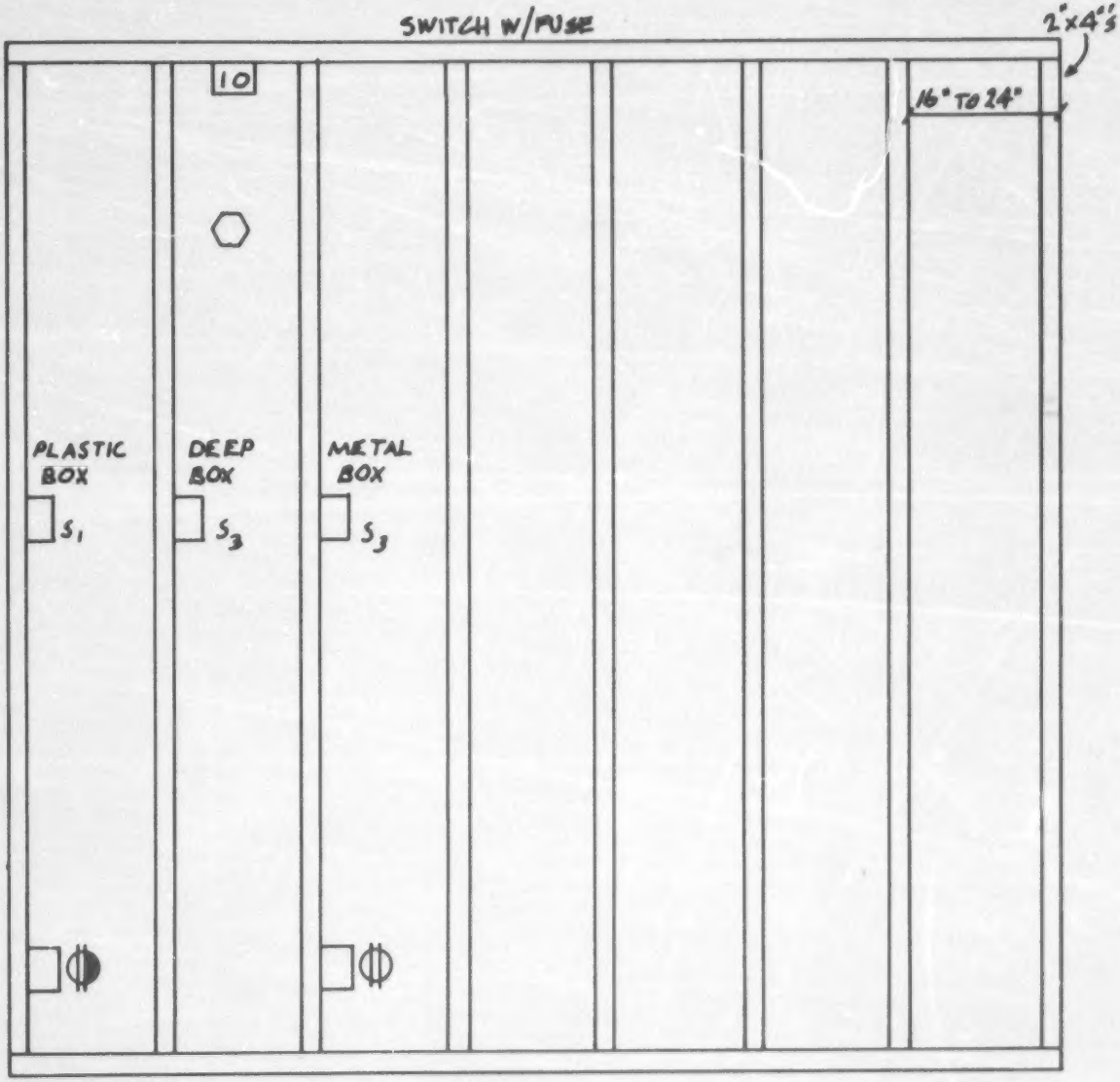
To install electrical devices and outlet boxes.

CONDITIONS AND LIMITATIONS:

Given the necessary tools and materials (including current NEC book, device and outlet boxes, wall mock-up or house setting), the student will install the device and outlet boxes in location as indicated on the plan, (Figure 8a). Only NEC book may be used as a reference. No time limit.

CRITERIA OF ACCEPTABLE PERFORMANCE:

1. Location of device and outlet boxes according NEC. Art. 300-15 and Art. 210-52.
2. Switch boxes 46" ± from subfloor.
3. Receptacle boxes 12" ± from subfloor.
4. Boxes to be securely fastened to frame and have no movement. (NEC, Art. 300-11, 370-13.)
5. Front edge of box to be flush with finished wall/ceiling.
6. Wall lighting receptacles 78" ± from subfloor.



COMPETENCY NO. 8
Figure 8a
Wall Mock-Up

TASK:

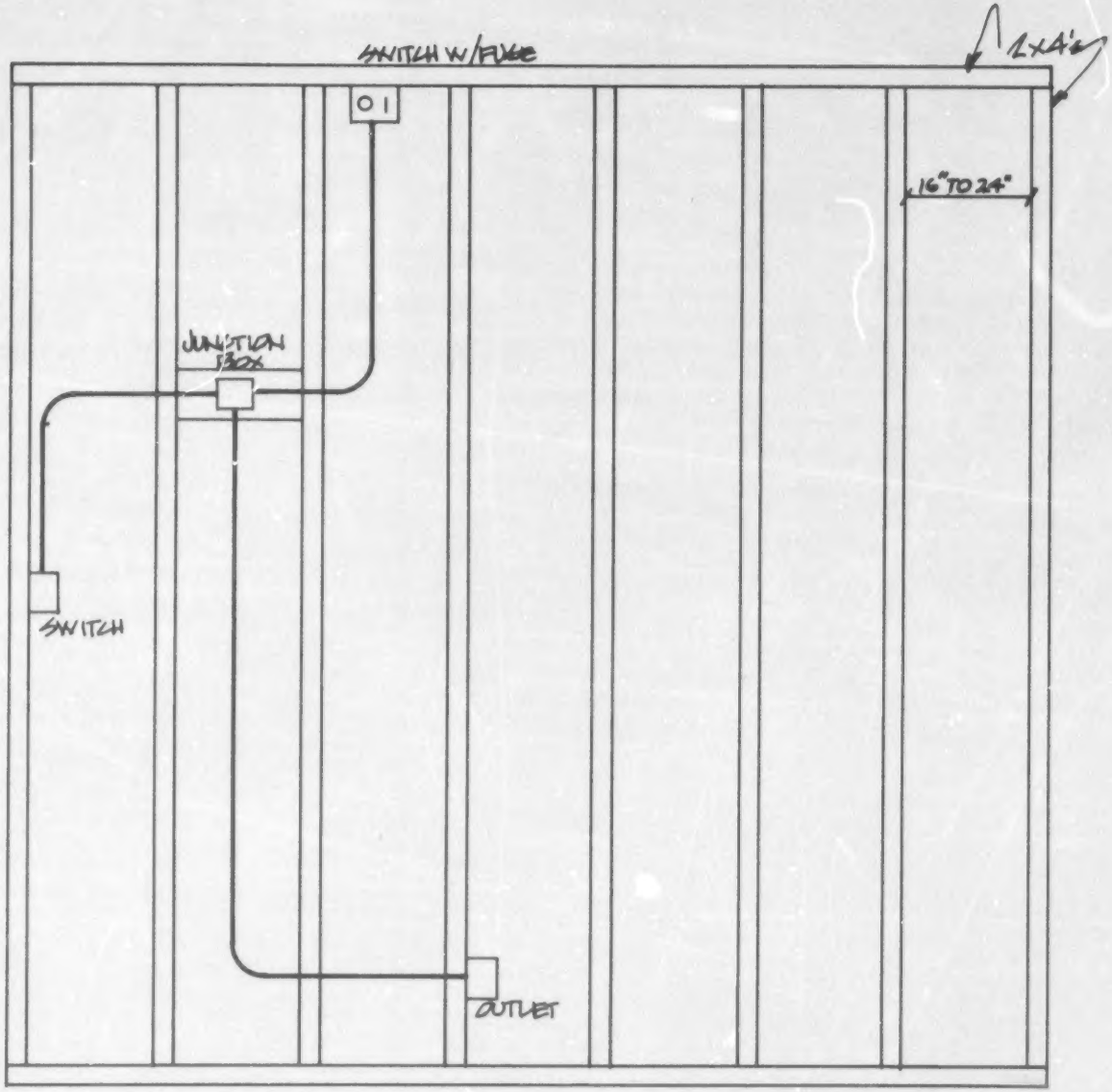
To install electrical metallic tubing.

CONDITIONS AND LIMITATIONS:

Given the necessary tools and materials (including conduit bender, reamer, cutter, EMT, conduit mounting devices, electrical plan, mock-up or house setting), the student will select size, cut, bend and install conduit according to current NEC book and local code. Electrical requirements of house or mock-up plan (Figure 9a) to be followed. Only NEC book may be used as reference. No time limit.

CRITERIA OF ACCEPTABLE PERFORMANCE:

1. Installation according to house plan or mock-up plan (Figure 9a)
2. Installation to meet criteria of NEC 348-1 through 15 and 336-6.
3. Installation to meet portions of local code that exceed NEC criteria



COMPETENCY NO. 9
Figure 9a

TASK:

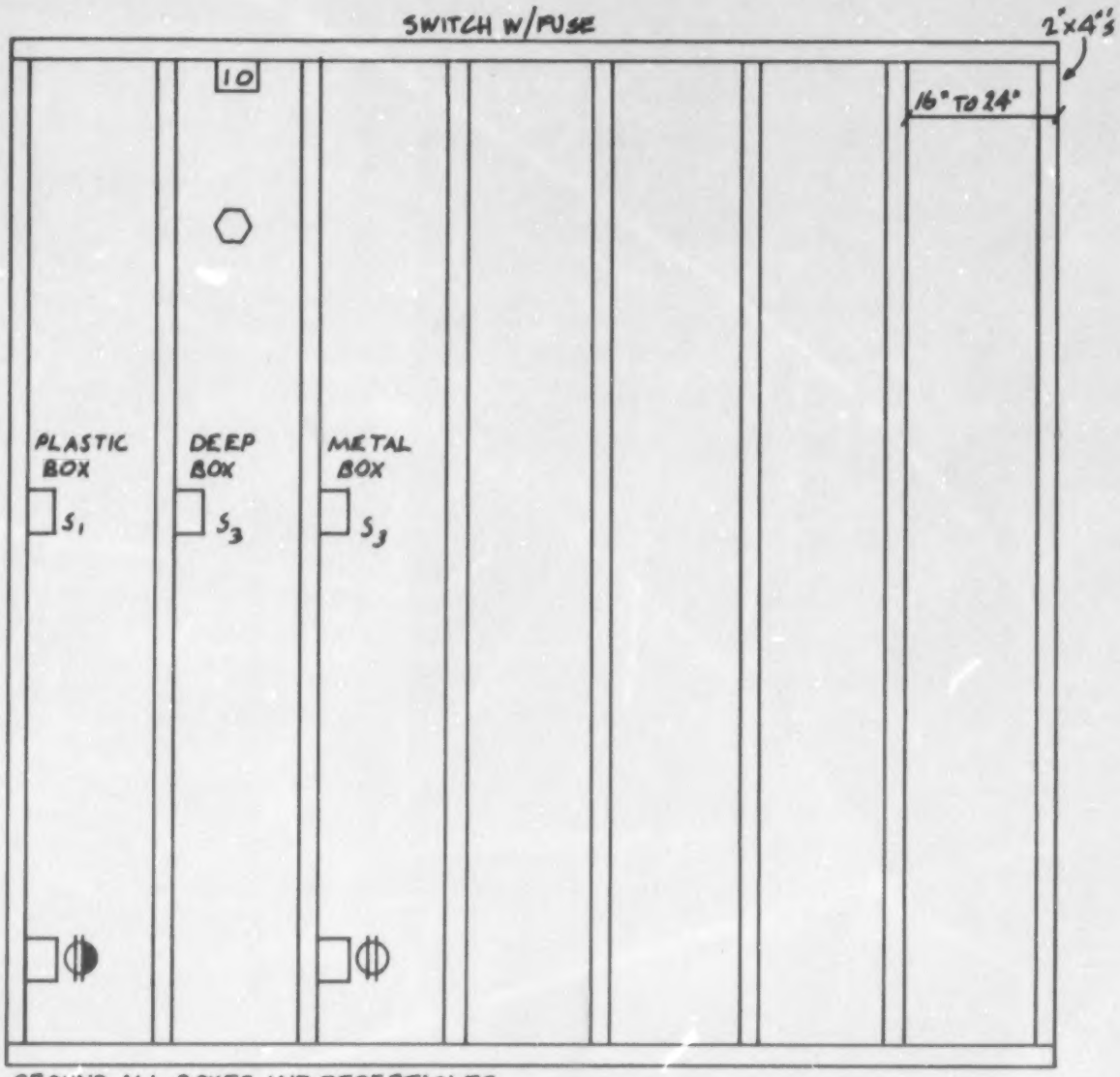
To install non-metallic sheathed cable and splice wires.

CONDITIONS AND LIMITATIONS:

Given proper tools and material (including current NEC book, staples, wires, wire nuts, electrical house plan or mock-up plan [Figure 10a]), wall or wall mock-up, the student will drill holes, select wire and run cable as noted in 10a or on electrical house plan. All wires to be fed through box knockouts and secured with clamps or connectors. The wires will be cut, stripped, identified, and spliced, ready for device or fixture. No time limit. References may be used.

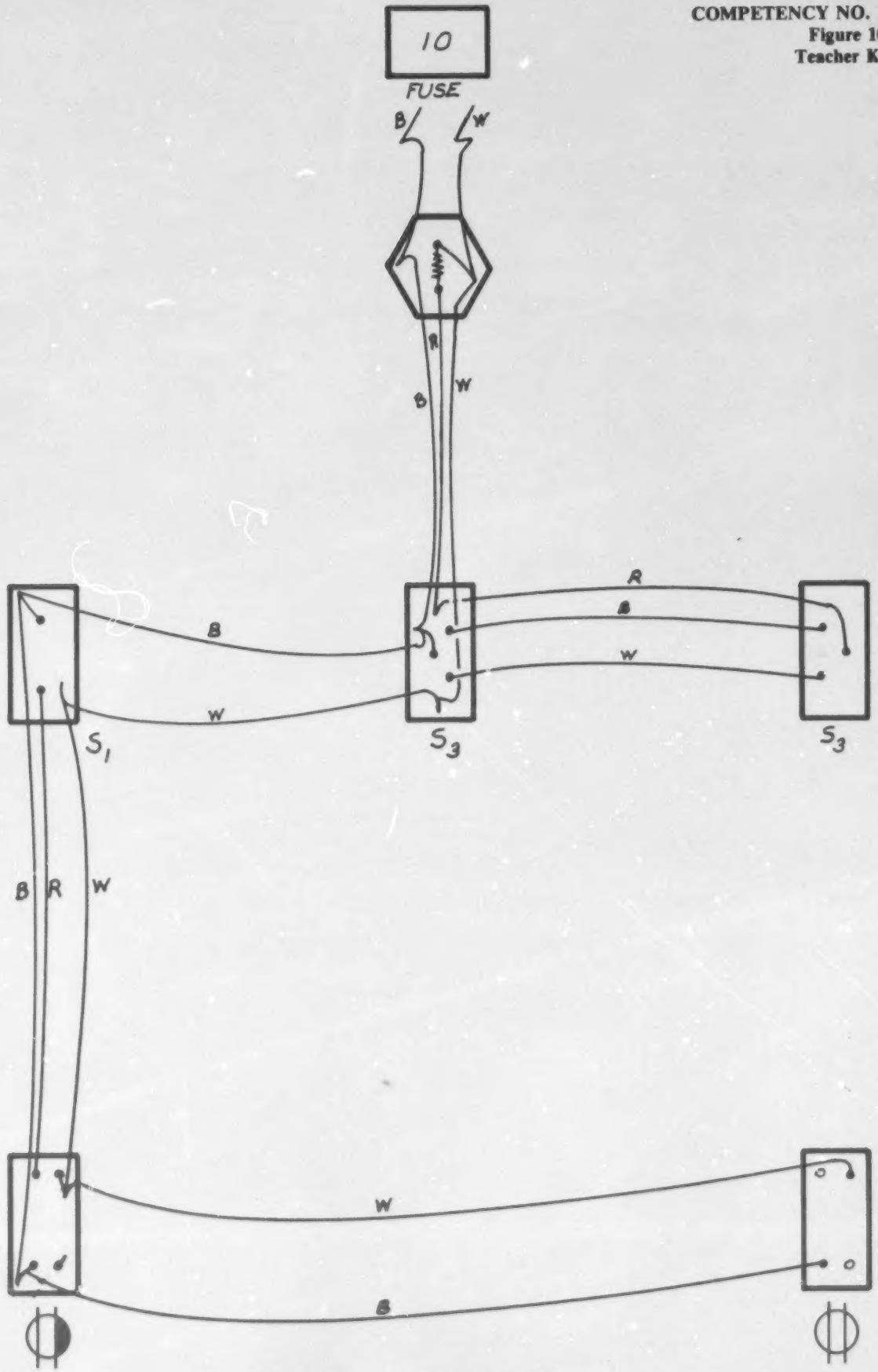
CRITERIA OF ACCEPTABLE PERFORMANCE:

1. Holes drilled according to NEC. 300-4-(a) and 336.
2. Wires stripped according to NEC. 300 - 14.
3. Wire selected for single pole, three-way and four-way circuits according to Sear's "Electrical Wiring" Section 4.
4. Wires fed from individual circuits (loop) to service entrance panel
5. No twist in wire
6. Knockout plugs removed only where cable enters (NEC 370-7).
7. Wire connectors (clamps) installed according to NEC 370-7.
8. Wire fed into device and outlet boxes and spliced according to Sear's "Electrical Wiring" Section 6.
9. Wire secured with staples, straps or similar fitting according to NEC 336-5.
10. Conductor in contact with connectors (clamps) must have outer sheath present according to NEC 370-7.
11. Bends according to NEC 336-10.
12. Wiring to conform to suggested Teacher's Key (Figure 10b).



GROUND ALL BOXES AND RECEPTACLES
S_1 SWITCH TO SERVE HALF OF THE SPLIT RECEPTACLE
S_3 SWITCHES TO SERVE LIGHT OUTLET
DUPLEX OUTLET ON SAME CIRCUIT AS S_1 SWITCH

COMPETENCY NO. 10
Figure 10a
Wall Mock-up


10
FUSE
B
W
R
B
W
B
W
R
B
W
S_1
S_3
S_3
B
R
W
W
B

TASK:

To connect wires in convenience boxes and service entrance panel.

CONDITIONS AND LIMITATIONS:

Given proper tools and materials (including house setting or wall mock-up, switches, outlet receptacles, lighting receptacle covers, and service entrance box, cable installed and the wall finished), the student will correctly connect all wires to receptacles, switches and etc. within the service boxes and to the service panel. All connections to correspond to wire identification from competency 10. Each convenience must be secured to device box with mounting screws. Covers to be installed. Only NEC book may be used as reference. No time limit.

CRITERIA OF ACCEPTABLE PERFORMANCE:

1. Wires connected according to plan (Figure 10a) and Electrical Wiring Handbook (Sears) Section 2 & 4 (or modification of wiring diagram).
2. Wires to be folded in "S" shape when convenience is pushed into device box.
3. Convenience to be securely installed with screws supplied.
4. Conveniences to be plumb or level.
5. Cover plates installed with screws provided. (Cover plate must not crack.)

TASK:

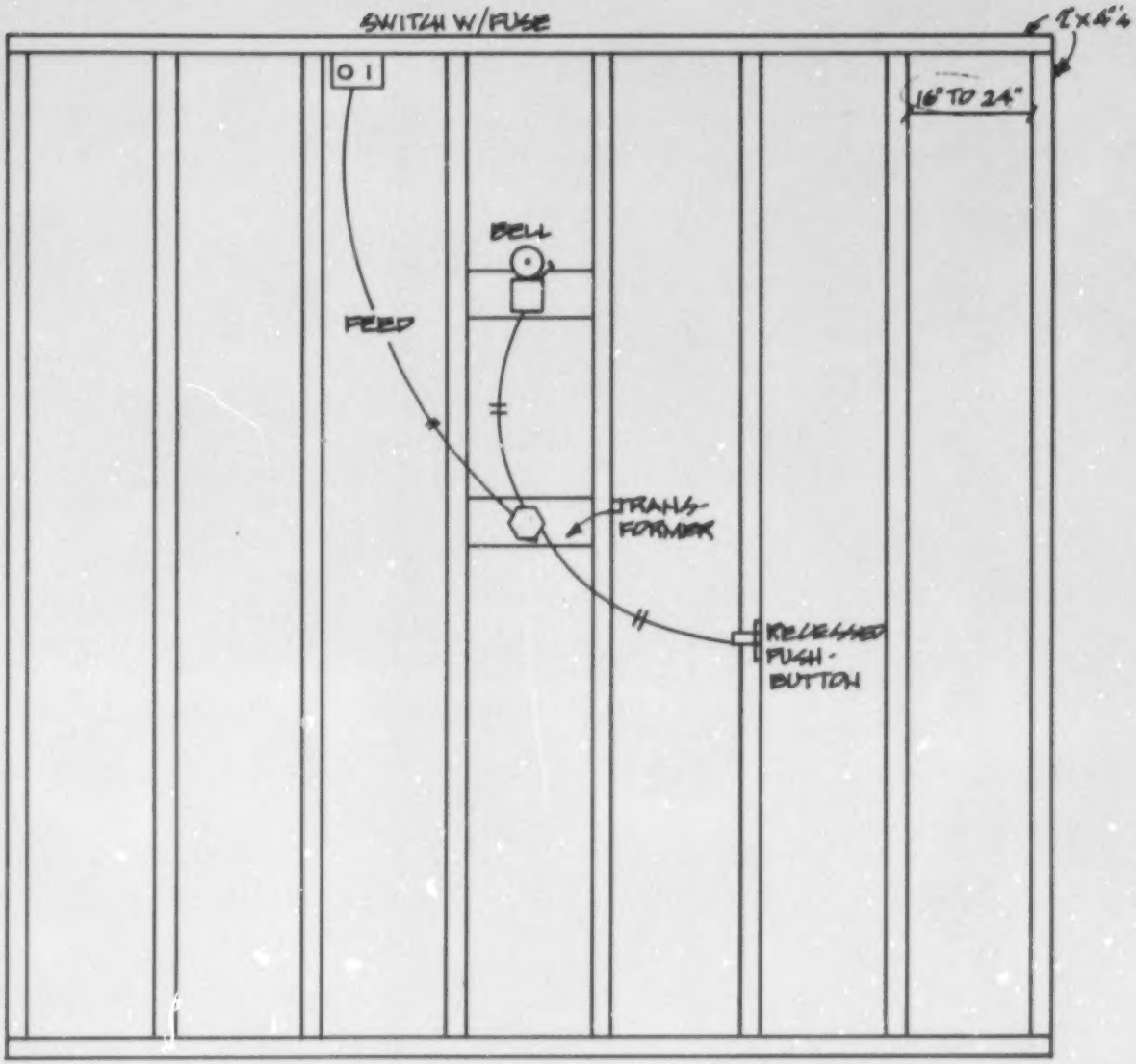
To install low voltage device (doorbell).

CONDITIONS AND LIMITATIONS:

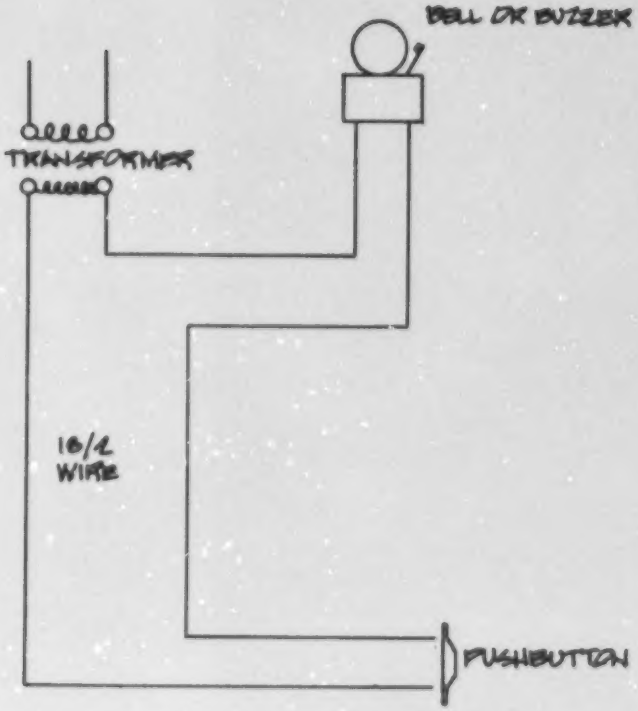
Given proper tools and materials (including current NEC book, 16 volt transformer, door bell or chime, button, wire, staples, house electrical plan or wall mock-up [Figure 12a]), the student will run and secure wire, attach door bell hardware and make wire connections. Only NEC book may be used as reference. No time limit.

CRITERIA OF ACCEPTABLE PERFORMANCE:

1. Holes drilled according to NEC 300-4-(a) and 336.
2. Wire stripping according to NEC 300 - 14.
3. Button attached 48" ± above stoop (landing).
4. Transformer attached to live power source.
5. Bell (chimes system) to be audible from all parts of residence if in house setting.
6. Wire secured with staples, straps or similar fitting according to NEC 336-5.
7. Wiring according to Electrical Wiring Handbook (Sears) Section 6, or Teacher Key (Figures 12a & 12b).



COMPETENCY NO. 12
Figure 12a



COMPETENCY NO. 12
Figure 12b
Teacher Key

TASK:

To design and layout a plumbing system.

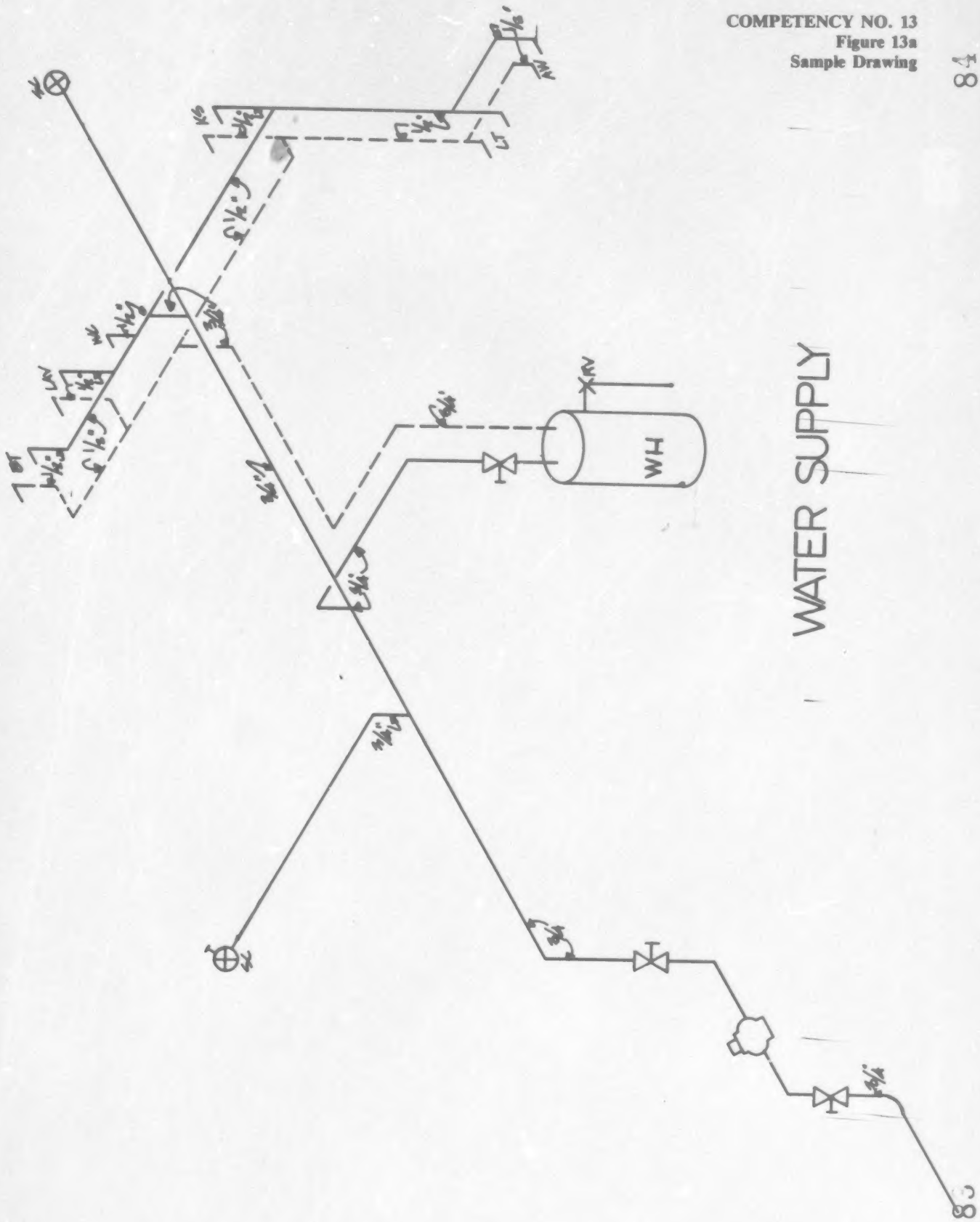
CONDITIONS AND LIMITATIONS:

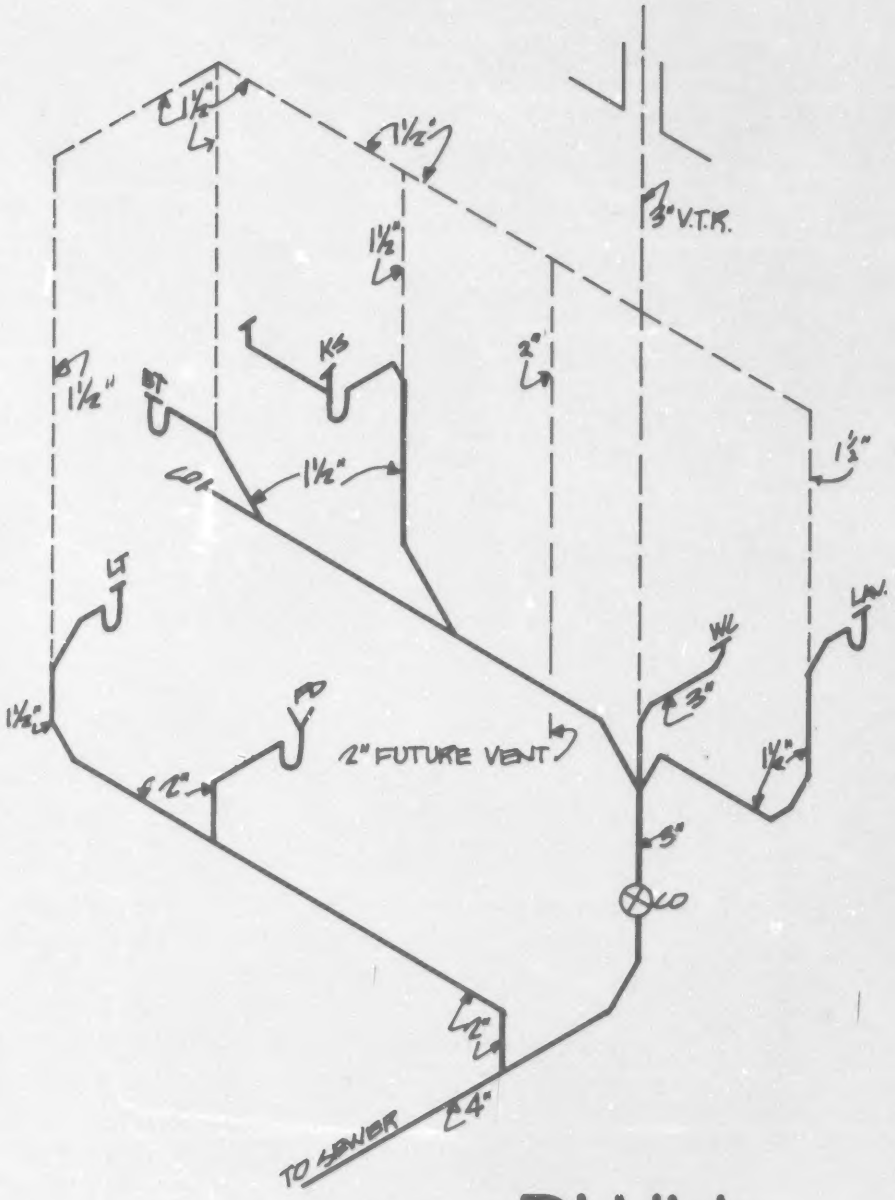
Given the plans for a residence (Figure 26a - n), current National Plumbing Code book, the sample plumbing isometrics (Figures 13a & 13b), the student will draw complete isometric views of the plumbing system (waste and supply) for the residence. All pipe sizes and fittings to be identified in isometrics. All fixtures will be identified in isometrics view. Supply system begins at point where water enters building. Waste systems ends at point leading to main sewer. No references, except Figures 13a & 13b and National Plumbing Code book may be used.

CRITERIA OF ACCEPTABLE PERFORMANCE:

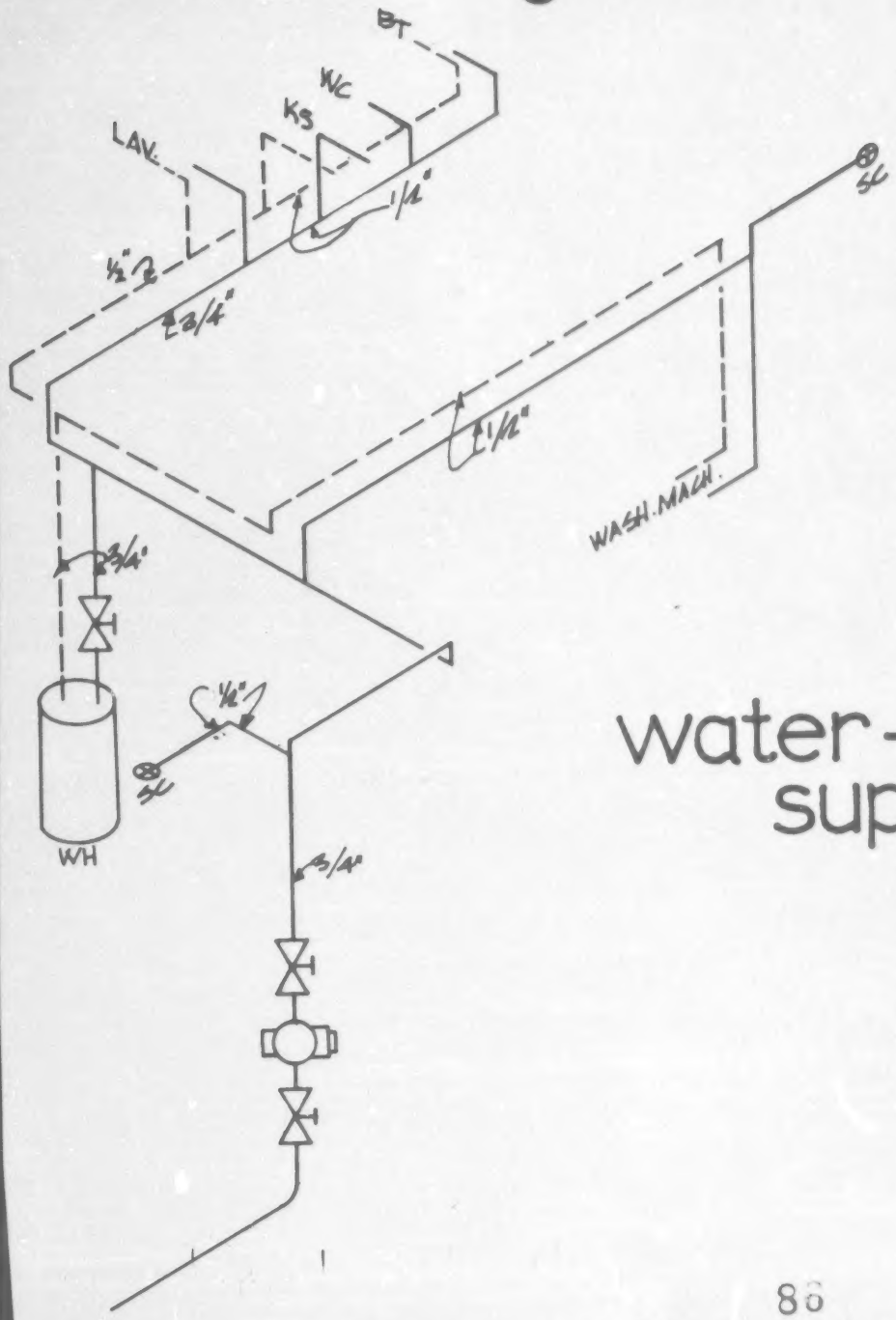
1. Pipe sizes, fittings and fixtures shown and labeled according to key, (Figures 13c & 13d).
2. Pipe sizes according to National Plumbing Code.
3. Each fixture must have a water supply and waste system.
4. Shut off and clean-outs shown as required by National Plumbing Code.

COMPETENCY NO. 13
Figure 13a
Sample Drawing



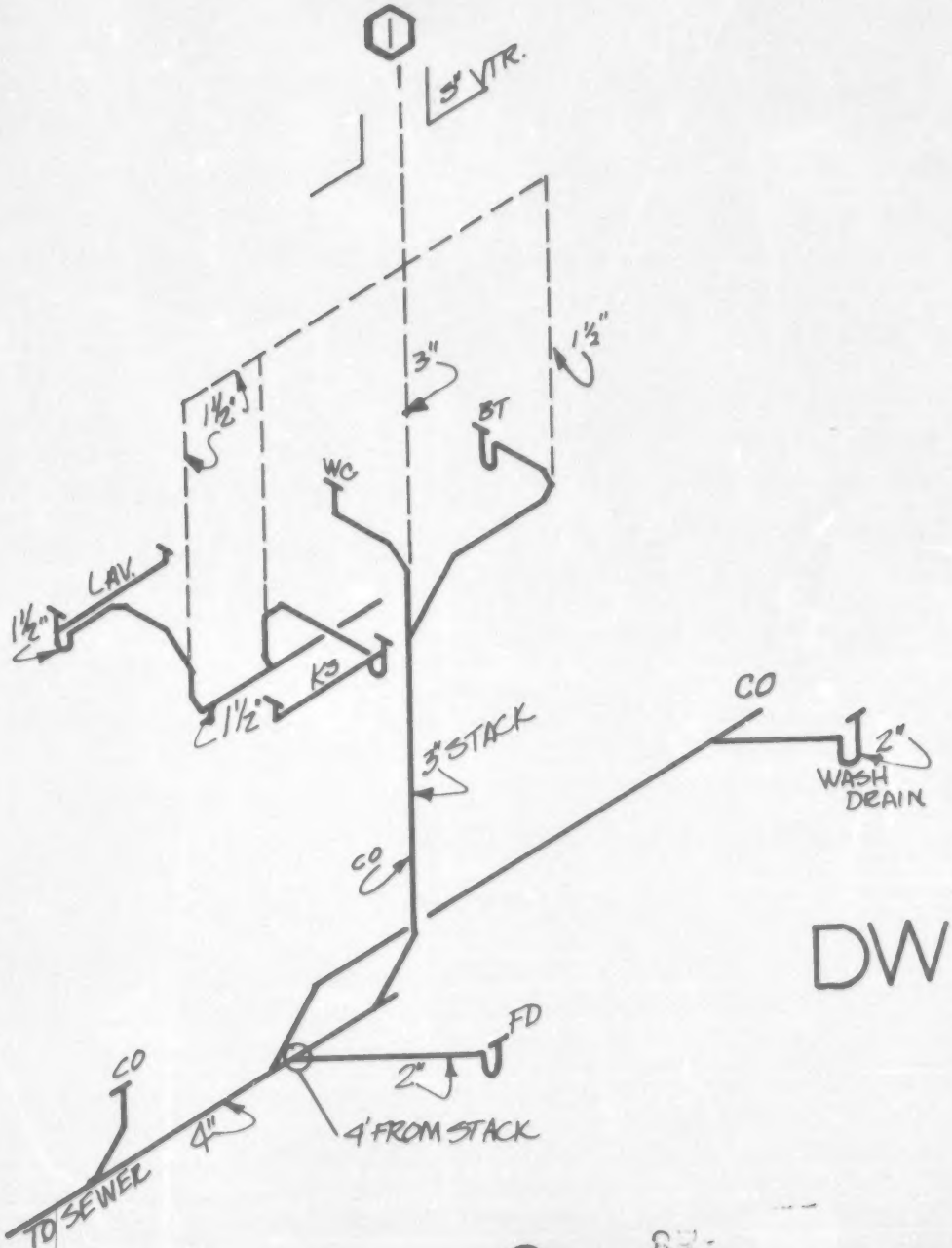

1½"
1½"
3" V.T.R.
1½"
KS
2"
1½"
ST
1½"
CO
1½"
LT
LAV.
WC
1½"
TO
2" FUTURE VENT
3"
1½"
2"
3"
CO
2"
4"
TO SEWER

DWV



water-supply

COMPETENCY NO. 13
Figure 13c
Teacher Key



COMPETENCY NO. 13
Figure 13d
Teacher Key

TASK:

To estimate water supply, fixture and drain-waste-vent (DWV) plumbing materials.

CONDITIONS AND LIMITATIONS:

Given a complete floor and basement plan (Figures 26c & 26d) including the plumbing layout and isometrics completed for Competency #13, National Plumbing Code, catalogs with prices and estimate sheets (Fig. 14a), the student will list all materials and total material costs for water supply, fixture and drain-waste-vent beginning at basement water supply entrance and ending at basement exit of drain-waste-vent line. All pipes, fittings, tubing, fixtures and accessories to be included. Materials must be itemized and grouped on estimate sheet including quantities, unit prices and totals. Labor costs not included. No time limit. References may be used. Calculator may be used.

CRITERIA OF ACCEPTABLE PERFORMANCE:

1. Estimate to include quantities given in teacher's key (Figure 14b) and include all pipes, tubing, fittings, fixtures, and accessories.

2. Prices to be according to catalogs used and extended with ± 3% accuracy.

3. Total cost to be accurate within ± 3%.

plumbing materials estimate

COMPETENCY NO. 14
Figure 14a

Contractor GAL/LPB/EEU-6

Estimator _____

Date _____

Page No. 1 of _____

Job Name EXP. HOUSE #1982

# Pieces	Size	Length	Description	Total	Units	Unit Price	Total Price

SCC M0157

89

# Pieces	Size	Length	Description	Total	Units	Unit Price	Total Price

plumbing materials estimate

COMPETENCY NO. 14
Figure 14b
Teacher Key

Contractor SCC/LFS/ESU-6
Estimator
Date
Page No. 1 of 3
Job Name EXP HOUSE #1982

Perimeter of exterior stud wall
Perimeter of exterior foundation wall
Interior lineal feet of walls (house)
Lineal feet of garage walls
Square footage of house
Total lineal feet of door opening

# Pieces	Size	Length	Description	Total	Units	Unit Price	Total Price
			WATER SUPPLY PIPE COPPER				
4	½"	20'	TYPE M	80'			
2	¾"	20'	TYPE M	40'			
6	¾"		90° ELLS				
2	½"		DROP EARRED ELLS				
1	¾" x ¾" x ¾"		TEE				
2	¾" x ¾" x ½"		TEE				
1	¾" x ½" x ½"		TEE				
1	½" x ½" x ¾"		TEE				
7	½" x ½" x ½"		TEES				
14	½"		90° ELLS				
4	¾"		MIP ADAPTORS				
6	½"		COUPLINGS				
2	¾"		COUPLINGS				
3	¾"		VALVES				
2	½"		FROST PROOF WALL HYDRANTS				
1	¾"		WATER METER.				
1	1.7oz CAN		SOLDERING FLUX				
1	1 lb. CAN		PUTTY				
7	½" x ⅜"		CHROME SHUT-OFF VALVES				
7	½"						
6	⅜"		CHROME WATER SUPPLY PIPE				
1	⅜"		CHROME WATER SUPPLY PIPE W/C				

SCC M0157

# Pieces	Size	Length	Description	Total	Units	Unit Price	Total Price
			FIXTURES				
1	32"x60"		CAST IRON TUB				
2			SINGLE OVAL LAVATORY				
1			WATER CLOSET				
1			DOUBLE KITCHEN SINK				
1			GARBAGE DISPOSER				
1			COMBINATION SHOWER-				
			BATH FAUCET				
1			KITCHEN FAUCET ASSEMBLY				
2			LAVATORY FAUCETS				
2			CLOTHESWASHER HOSE				
			BIBBS				
1			WATER HEATER				
			DWV PLASTIC PIPE				
1	1½"		KITCHEN DRAIN UNIT				
			AND TRAP				
2	1¼"		LAVATORY DRAIN UNIT				
			AND TRAP				
1	1½"		TUB DRAIN UNIT				
			AND TRAP				
1			WAX RING WATER CLOSET				
1	3"		WATER CLOSET FLANGE				
2	¼"		CLOSET BOLTS AND				
			CHINA CAPS				
2	3"x3"x1½"		SANATATION TEES				
1	3"x3"x1½"x1½"		SANATATION CROSS				
1	4"x3"		CAST IRON TO PVC ADAPTOR				
1	3"		90° ELL				
4	1½"		90° ELLS				
5	1½"		SANATATION TEES				
1	3"		ROOF JACK				
3	3"	10'	PVC SCH. 40 PIPE	30'			
5	1½"	10'	PVC SCH. 40 PIPE	50'			
1			PVC SOLVENT				
1			PVC CLEANER				
3	3"		COUPLINGS				

# Pieces	Size	Length	Description	Total	Units	Unit Price	Total Price
			CAST IRON UNDER GROUND				
			DRAIN PIPE				
6	4"	5'	CAST IRON DRAIN PIPE	30'			
3	2"	5'	CAST IRON DRAIN PIPE	15'			
1	4"x4"x4"		COMBINATION Y AND 1/8 BEND				
1	4"		CLEANOUT				
2	4"x2"		"Y"s				
1	4"		90° 1/4 BEND 90°				
2	2"		1/8 BENDS				
1	2"		FLOOR DRAIN				
1	2"		P TRAP				
1	2"		1/4 BEND 90°				
1	2"		CLEANOUT				
1	2"		"Y"				

TASK:

To install residential drainage soil pipe system.

CONDITIONS AND LIMITATIONS:

Given the necessary tools and supplies (including 6"-8" ID tile or concrete sewer pipe, 4" ID tile or cast iron sewer pipe, soil pipe cutter, 4" diameter hub with neopreme gasket) the student will cut a hole in the 6"-8" mainsewer pipe with a drill, hammer and chisel, cut hub to fit with a soil pipe cutter, cut 4" ID tile to a 12" length with chisel and hammer. Assemble using epoxy. Assembly must conform to National Plumbing Code. No time limit. No reference may be used.

CRITERIA OF ACCEPTABLE PERFORMANCE:

1. Hole in 6"-8" main sewer pipe to be no greater than 1/4" diameter larger than the OD of the sewer pipe..
2. Sewer pipe to enter main sewer at a 45° or 90° angle (7½° tolerance).
3. Hub pipe cut to same length as wall thickness of main sewer (¼" tolerance).
4. Base of hub to fit snuggly against main sewer.
5. 4" ID tile to be 12" in length (½" tolerance including jagged edge). No cracks in pipe.
6. 4" ID tile to bottom-out in the hub (± 2-3/4" into hub when assembled).

TASK:

To install copper and PVC pipe.

A. Copper Water Supply System

CONDITIONS AND LIMITATIONS:

Given the necessary tools and materials (including propane torch, tubing cutter, copper pipe, 50-50 solder, flux, abrasive cloth and fittings), the student will cut the pipe and sweat the joints in position as indicated in Figure 16a. Mock-up to be in up-right position when sweating. Thirty minute time limit. References may not be used.

CRITERIA OF ACCEPTABLE PERFORMANCE:

1. Length of assembled pipe to be as specified in Figure 16a (1/8" tolerance).
2. Upright position of pipe not altered when sweating.
3. No leaks in joints when subjected to 50 p.s.i. or local water pressure for 5 minutes.
4. All angles to be 90° and all pipe vertical and horizontal in same plane (2° tolerance).
5. Task completed within specified time limit.

B. PVC Waste System

CONDITIONS AND LIMITATIONS:

Given the necessary tools and materials (including hack saw, PVC pipe, PVC solvent, and fittings), the student will cut the pipe and glue the joints with PVC solvent in position as indicated in Figure 16a. Mock-up to be in up-right position when gluing. Thirty minute time limit. References may not be used.

CRITERIA OF ACCEPTABLE PERFORMANCE:

1. Length of assembled pipe to be specified in Figure 16a (1/8" tolerance).
2. Upright position of pipe not altered when gluing.
3. No leaks in joints when mock-up is filled with water.
4. All angles to be 90° and all pipe vertical and horizontal in same plane. (2° tolerance).
5. Task completed within specified time limit.

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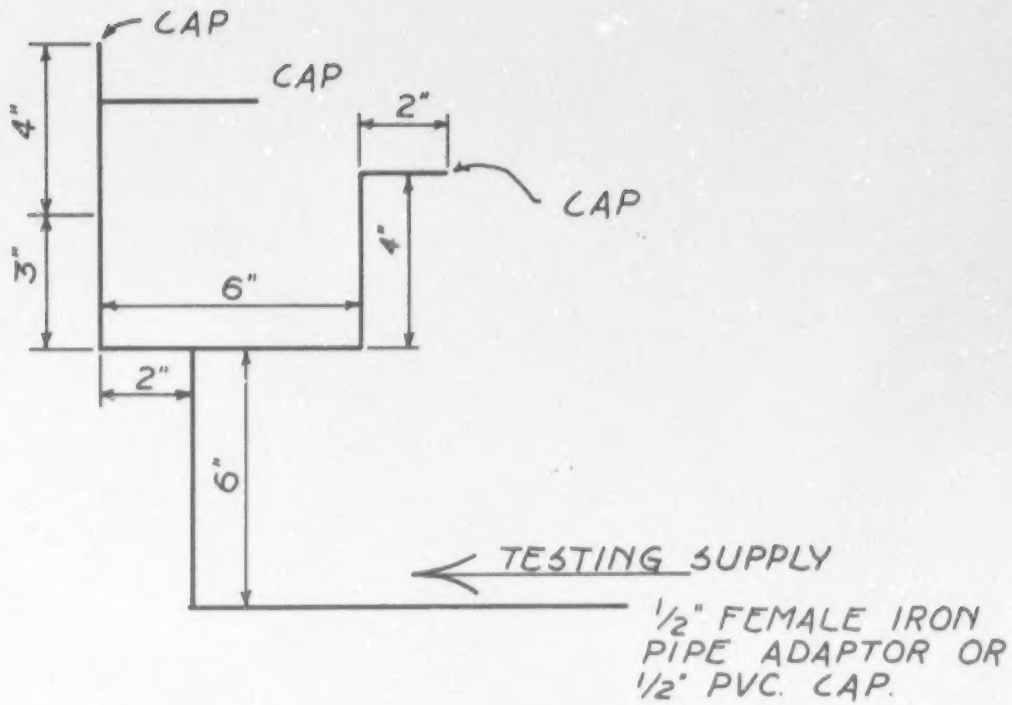
TYPE M ½" COPPER PIPE OR 1 ½" PVC PIPE TO BE USED

(TOP)



(BASE)

MEASUREMENTS TO BE CENTER TO CENTER OR END TO CENTER.

TASK:

To install water closet and set Hude rim sink and fixtures.

GENERAL CONDITIONS AND LIMITATIONS:

Given the proper tools and materials (including pipe dope, 3/8" chrome tubing, adapters, and 3/8" copper supply line), the student will install the fixtures. One hour time limit per unit. References may not be used.

A. Hude Rim Sink

CONDITIONS AND LIMITATIONS:

Given the general conditions and limitations, Hude rim sink, one piece faucet set, plumbers stainless putty, 1½" combination drain and trap, and 1½" plastic adaptors, the student will install faucet in sink and drain waste fitting, install sink in counter top with Hude rim clips and plumbers stainless putty, connect supply lines, assemble and install "P" trap and connect to drain-waste line.

CRITERIA OF ACCEPTABLE PERFORMANCE:

1. Sink rim at counter top will not leak water.
2. Drain waste fitting adjusted to prevent leakage when closed.
3. No leaks at fixture compression fittings on supply lines when subject to minimum 50 lb. per square inch water pressure.
4. No leaks in drain line when water is released.
5. Sink securely fastened to counter top with no leakage.
6. Water supply holes in fixture to be parallel to backsplash or wall.
7. Excess plumbers stainless putty removed.
8. Work area to be ready for occupancy.

B. Water Closet

CONDITIONS AND LIMITATIONS:

Given the general conditions and limitations, standard flush-action water closet bowl, wax ring and closet bolts, the student will assemble the water closet, apply bowl wax ring to 4" closet flange, set water closet in place and install closet bolts. Covers to be placed over floor bolts and supply line connected.

CRITERIA OF ACCEPTABLE PERFORMANCE:

1. Tank to set parallel to wall and perpendicular to floor.
2. Water supply completely stopped when tank is full.
3. No water released by ballcock when tank is full.
4. No leaks at supply connection and/or seat of tank.
5. No leaks at floor connection of bowl.

6. Floor bolt covers in place.

7. No chips in porcelain.

8. Work area to be ready for occupancy.

TASK:

To apply shingles and appropriate flashings.

GENERAL CONDITIONS AND LIMITATIONS:

Given necessary tools and materials (including gutter apron, chimney and valley flashing, rake drip edge [if needed], nails and hip/ridge cap) a 4/12 (min.) hip roof and/or mock-up with roof framing, sheathing and felt in place, the student will apply the shingles, gutter apron, chimney and valley flashing, rake drip edge (if needed), and hip/ridge cape to the roof and/or mock-up according to manufacturer's specifications.

A. Asphalt Shingles

CONDITIONS AND LIMITATIONS:

Given the general conditions and 3 tab, self-stick 240# asphalt shingles, the student will apply the asphalt shingles and required flashing.

CRITERIA OF ACCEPTABLE PERFORMANCE:

Work must comply with the Residential Asphalt Roofing Manual, by the *Asphalt Roofing Manufacturing Association Standards*, 1980 Edition or manufacturer's specifications.

B. Wood Shingles

CONDITIONS AND LIMITATIONS:

Given the general conditions, western red cedar shingles (#1 or #2), the student will apply the wood shingles and required flashing.

CRITERIA OF ACCEPTABLE PERFORMANCE:

Work must comply with *Red Cedar Shingle and Handsplit Shake Bureau*, "Brochure #34" and "Brochure #35" or manufacturer's specifications.

C. Wood Shake

CONDITIONS AND LIMITATIONS:

Given the general conditions, western red cedar shakes (#1 or #2, handsplit, resawn), the student will apply the shakes and required flashing.

CRITERIA OF ACCEPTABLE PERFORMANCE:

Work must comply with *Red Cedar Shingle and Handsplit Shake Bureau*, "Brochure #34", "Brochure #35", and "Certi-Split Manual of Handsplit Red Cedar Shakes, 1971", or manufacturer's specifications.

TASK:

To apply gypsum wallboard.

GENERAL CONDITIONS AND LIMITATIONS:

Given the proper tools and equipment, wallboard, ring-shanked drywall nails, adhesive, tape, joint compound, wall or wall mock-up having two adjoining walls requiring a vertical joint and horizontal joint, window opening and an electric box opening, inside and outside corners and ceiling, the student will complete the following parts according to manufacturer's specifications. No time limit. No references may be used.

A. Measure, Cut and Apply Wallboard

CONDITIONS AND LIMITATIONS:

The student will measure, cut to size and apply the wallboard to the ceiling and walls. Application to include a vertical joint, horizontal joint, window opening, electric box opening, inside corner and outside corner. Nail and/or glue as required.

CRITERIA OF ACCEPTABLE PERFORMANCE:

1. Joints to be butted (1/4" tolerance).
2. Tapered edge to be used for horizontal joints.
3. Vertical joints to occur on studs.
4. No joints at window corners.
5. Nailing and/or gluing according to specifications listed in Georgia Pacific, Gypsum Division, "Gypsum Wallboard Application", or manufacturer's specifications.

B. Taping the Joints and Filling Nail Head Dimples

CONDITIONS AND LIMITATIONS:

The student will apply bedding compound, tape, and finish coats to all vertical joints, horizontal joints and inside corners, and cover nail head dimples.

CRITERIA OF ACCEPTABLE PERFORMANCE:

1. Width of bedding compound to be no wider than tapered edges.
2. Tape to be centered over joints, imbedded in compound, bonded to wall board; no wrinkles, bubbles, laps in tape or uneveness; excess compound removed.
3. End joints: Second coat to be 5" - 6" off-center of factory end and tapered (feathered) to outside. Finish coat to be 7" - 9" off-center of factory end and tapered to wall surface. Sanded to remove imperfections, but not through to tape or wallboard finish surface.
4. Rolled edge joints: second coat to be 3" - 4" each way from center line of joint and tapered (feathered) to outside. Finish coat to be 5" - 6" each way from center line of joint and flush with wall surface. Sanded to remove imperfections, but not through to tape or wallboard finish surface.
5. Inside corner: Tape folded on center line crease. Other criteria same as number 4.
6. Nail heads covered with compound, level with board surface, nail heads not exposed.

C. Apply Metal Trim

CONDITIONS AND LIMITATIONS:

The student will select proper metal trim for outside corner, measure and cut, nail in place, apply joint compound coats and sand.

CRITERIA OF ACCEPTABLE PERFORMANCE:

1. Metal trim to be corner bead with width according to manufacturer's specifications for thickness of wallboard.
2. Trim cut to length (1/8" tolerance).
3. Trim not bowed when installed.
4. Nailing to be according to manufacturer's specifications. Nail heads flush with metal trim. No hammer dents in bead or flange. Flange to be flat on wallboard surface.
5. Broadknife used to apply coats. Application of compound to be according to manufacturer's specifications with a minimum of 8", maximum of 12", width each way from the bead.
6. Sanding to be minimal. High spots removed, maintaining flat surface between bead and wallboard flush surface. 3/16" of top of bead visible.

TASK:

To apply wall paneling.

GENERAL CONDITIONS AND LIMITATIONS:

Given proper tools and materials (including 4 x 8 wall paneling, 2 adjoining walls or a 2-wall mock-up which require a vertical joint, window opening, electrical box opening and inside/outside corners), the student will measure, cut and apply the wall paneling and trim according to manufacturer's specifications. No time limit. References may not be used.

CRITERIA OF ACCEPTABLE PERFORMANCE:

1. All measurements and cuts to be within 1/16" tolerance.
2. Application of paneling to meet specifications listed in Georgia-Pacific Handbook, "The Paneling Book" February 1980 or later edition or manufacturer's specifications.

TASK:

To apply paint and varnish finishes.

A. Apply Latex Paint with an Airless Spray Gun.

CONDITIONS AND LIMITATIONS:

Given the proper tools and materials (including an airless spray gun, flat latex paint and a brick-pattern concrete surface [either a wall or 64 sq. ft. mock-up]), the student will clean and prepare the work surface, prepare paint for spraying, prime (if necessary) and paint the wall surface. Repeat coats as necessary. Clean equipment and work area. No references (except manufacturer's specifications) may be used. No time limit.

CRITERIA OF ACCEPTABLE PERFORMANCE:

1. Surface to be free of dirt, grease, and defects.
2. Primer (if recommended by manufacturer) applied evenly (no runs, sags and/or globs).
3. Paint prepared according to manufacturer's specifications.
4. Air pressure and fluid feed of gun set to manufacturer's specifications.
5. Paint applied evenly (no runs, sags and/or globs).
6. Gun cleaned of all paint.
7. No over-spray, drift or drops of paint on other areas.
8. Work area left ready for occupancy.

B. Apply Latex Paint with Roller.

CONDITIONS AND LIMITATIONS:

Given the proper tools and materials (including a 7"-12" paint roller, flat latex paint and horizontal lap siding surface [either a wall or 64 sq. ft. mock-up]), the student will clean and prepare the work surface, prepare paint, prime (if necessary) and paint the siding using a brush to paint the butt edge and a roller for the surface. Repeat coats as necessary. Clean equipment and work area. No references (except manufa.turer's specifications) may be used. No time limit.

CRITERIA OF ACCEPTABLE PERFORMANCE:

1. Surface to be free of dirt, grease and defects.
2. Primer (if recommended by manufacturer) applied evenly (no runs, sags and/or globs).
3. Paint prepared according to manufacturer's specifications.
4. Paint applied evenly (no runs, sags and/or globs)
5. Equipment cleaned of all paint according to manufacturer's specifications.
6. No paint or drops of paint on other areas.
7. Work area left ready for occupancy.

C. Apply Synthetic Varnish with Brush.

CONDITIONS AND LIMITATIONS:

Given the proper tools and materials (including a varnish brush, synthetic varnish, door or window unit with trim [either hung or mock-up]), the student will clean and prepare the work surface, prepare varnish for brush application, seal (if necessary) and varnish the door/window and trim. Repeat coats as necessary. Clean equipment and work area. No references (except manufacturer's specifications) may be used. No time limit.

CRITERIA OF ACCEPTABLE PERFORMANCE:

1. Surface to be free of dirt, grease and defects.
2. Sealant (if recommended by manufacturer) applied evenly (no runs, sags and/or globs).
3. Varnish prepared according to manufacturer's specifications.
4. Varnish applied evenly (no runs, sags and/or globs).
5. Varnish applied to trim to cover up to the glass/wall but not overlap beyond 1/16".
6. Brush cleaned of all varnish.
7. Work area left ready for occupancy.

TASK:

To install vinyl or vinyl asbestos floor tile.

CONDITIONS AND LIMITATIONS:

Given the necessary tools and materials (including vinyl or vinyl asbestos floor tile, adhesive, floor primer, and floor tile cement remover), the student will prepare the surface and install the tile to a minimum area of 32 sq. feet containing a doorway, inside and outside corner and cut-out for floor register (or pipe). Finish tile floor to be ready for occupancy. No references (except manufacturer's specifications) may be used. No time limit.

CRITERIA OF ACCEPTABLE PERFORMANCE:

1. All foreign material removed from floor before tiling.
2. All surface defects repaired leaving a flat surface.
3. Center of room located (± 1/8") and center lines drawn to intersect at a 90° angle (no tolerance) forming quadrants.
4. Sealant applied to floor according to manufacturer's specifications.
5. Serrated trowel used to apply adhesive as specified by manufacturer.
6. Perimeter row of tile to be at least 1/2 the width of 2 full tiles.
7. Edges of adjoining tile to be butted tightly (no space, no tolerance).
8. Adjoining corners of tiles to meet exactly.
9. Tile next to base (shoe) or door jamb to be tight (no space) or covered by base (shoe) or jamb. Edges of cut-outs to be covered by register or flange.
10. No adhesive on surface, scraps removed and tools cleaned.

TASK:

To install vinyl sheet floor covering.

CONDITIONS AND LIMITATIONS:

Given the necessary tools and materials (including vinyl sheet floor covering, adhesive water proof seam sealant, adhesive remover, and 15# felt paper), the student will prepare the surface, make a pattern, and install the floor covering to a minimum area of 32 sq. feet containing a seam, doorway, inside and outside corner, and cutout for floor register (or pipe). Finished floor to be ready for occupancy. No references (except manufacturer's specifications) may be used. No time limit.

CRITERIA OF ACCEPTABLE PERFORMANCE:

1. All foreign matter removed from floor before laying floor covering.
2. All underlayment seams and defects filled and sanded, leaving a flat surface.
3. Nail heads set below surface, filled and sanded.
4. Pattern scribed on 15# felt to provide exact contour of all walls, doorways, corners and cutouts.
5. Pattern transferred to vinyl sheet (no tolerance).
6. Design of vinyl sheet to match at seams (no tolerance).
7. Vinyl sheet to fit all conformatives on final trial fitting before adhesive application. (1/8" tolerance allowed at walls if base covers, no tolerance at doors and cutouts.)
8. Adhesive applied according to manufacturer's specifications.
9. Place and bond vinyl to fit all conformatives, (1/8" tolerance allowed at walls if base covers—no tolerance at doors and cutouts), design to match at seams, no air bubbles, seams to be tight but not raised.
10. Seams sealed as required by manufacturer's specifications.
11. Floor cleaned with no adhesive on surface, scraps removed, and tools cleaned.

TASK:

To install carpet

CONDITIONS AND LIMITATIONS:

Given the necessary tools and materials (including juteback carpet, sponge padding, tack-strip, padding tape, carpet tape, power stretcher, knee kick, heat-seaming iron, stair tool [tucking chisel], spreader, and wall trimmer), the student will prepare the surface, lay padding and carpet to a minimum area of 9' x 12' containing a seam, doorway and cutout for floor register (or pipe). Finished floor to be ready for occupancy. No references (except manufacturer's specifications) may be used. No time limit.

CRITERIA OF ACCEPTABLE PERFORMANCE:

1. All foreign matter removed from floor before laying pad.
2. Tack-strip securely fastened to floor, 1/4" from wall and door jamb. Strip to be continuous on floor along walls and door jamb.
3. Padding to cover all areas within boundaries of tack-strip (-1/4" from strip allowed).
4. Padding seam centered on tape. Tape continuous on seam (no gaps). Stapled alternately on both sides of seam, 6" apart on same side of seam.
5. End of carpet on roll to be cut 90° with edge.
6. Carpet cut from roll 2" longer than longest length of room.
7. Direction of carpet nap to be toward entrance of room or seating area when placed on floor.
8. Filled areas of carpeting to have matching patterns, nap running in same direction, and seams straight.
9. Both carpet edges are butted tightly and bonded into tape (no loose edges). Seam to be in center of tape. Tape continuous on seam (no gaps).
10. Carpet stretched evenly (can be lifted no more than 1/2" above floor at center of room) and evenly, no puckers. Both edges of carpet to be same length after stretching. Tack strips not pulled loose.
11. No edges showing or puckers after tucking.
12. Door metal (if used) exact width of door opening (-1/16" tolerance). Visible surface to have no visible damage.
13. No damage to walls or woodwork, scraps removed and tools cleaned.

10,

TASK:

To install ceramic tile.

CONDITIONS AND LIMITATIONS:

Given the proper tools and materials (including square or mosaic ceramic tile) the student will prepare a wall surface, apply adhesive, tile, and grout, and seal ceramic tile on a minimum area of 16 sq. feet. The wall surface must contain a pipe cut-out, and outside corner, base row, cap row and at least one cut joint. Finished wall to be ready for occupancy. No references (except for manufacturer's specifications) may be used. No time limit.

CRITERIA OF ACCEPTABLE PERFORMANCE:

1. All foreign material removed from wall before tiling.
2. All surface defects repaired leaving a flat surface.
3. Sealant applied to wall according to manufacturer's specifications.
4. Horizontal centerline to be level and vertical centerline to be plumb (no tolerance).
5. Serrated trowel used to apply adhesive as specified by manufacturer.
6. Perimeter row of tile to be at least 1/2 the width of a full tile. Top row to be uncut.
7. Tile protrusion to be butted tight (no tolerance).
8. Adjoining corners to meet exactly (no tolerance).
9. Edges of cut-outs to be covered by escutcheon.
10. No adhesive on surface, scraps removed and tools cleaned.
11. Grout flush (even) with beginning of contoured edge of tile.
12. Sealant applied to tile according to manufacturer's specifications.

Enabling Tasks

The enabling tasks are the activities necessary for developing a job skill. The completion of all enabling tasks for a competency leads to achievement of that competency. They may become daily or weekly lesson plans if teachers develop conditions and criteria similar to those developed for the competencies. The enabling tasks have been suggested by people in business and industry.

COMPETENCY NO. 1: TO READ AND INTERPRET BLUEPRINTS

Read scales on architects scale.
Read and interpret views of drawings:
- Plan views
- Elevations
- Details
- Sections
- Plans

Read and interpret construction documents:
- Specifications
- Uniform building code
- Local building code

Read and interpret architectural/construction conventions:
- Title boxes
- Scales
- Symbols
- Notations
- Abbreviations
- Terminology
- Material details

Calculate:
- Square footage
- Square yardage
- Percentage
- Board feet
- Cubic feet
- Cubic yards
- Area
- Volumes
- Elevations

COMPETENCY NO. 2: TO ESTIMATE CONSTRUCTION MATERIAL QUANTITIES AND COSTS

Calculate:
- areas
- volumes
- square root
- weight
- lineal feet
- square feet
- board feet
- cubic feet
- cubic yards

use architect's scale
use calculator
read and interpret:
- architectural symbols
- construction material symbols
- construction material details
- construction specifications
- construction blueprints

locate product information in catalog
locate product prices in catalog
estimate:
- quantities of materials
- unit cost
- total cost

COMPETENCY NO. 3: TO PLACE AND FINISH A CONCRETE SLAB

Identify and use:
- hammer
- handsaw
- concrete finishing tools
- shovel
- steel tape
- concrete
- form material

read and interpret blueprints
cut and place wire mesh
place concrete
float concrete
trowel concrete
edge and seam concrete
clean work site and tools

COMPETENCY NO. 4: TO LAY CONCRETE BLOCK AND FACING BRICK

Identify and use:
- masonry tools
- masonry materials and products
- concrete block types
- facing brick types
- mortar types
- lintels

read and interpret blueprints
cut facing brick
secure brick ties

COMPETENCY NO. 5: TO DESIGN AND LAYOUT AN ELECTRICAL SYSTEM

identify electrical symbols
interpret NEC guidelines
use electrical templates
use basic drafting equipment, procedures and symbols
calculate electrical circuit loads
- general purpose
- special purpose
- appliance
- low-voltage

COMPETENCY NO. 6: TO ESTIMATE ELECTRICAL MATERIAL

use NEC as a reference
compute size of panel. (NEC chapter 9 "Tables", example #1).
calculate the number of lineal feet for all sizes and types of wire.
determine the number and kind of device boxes (NEC Art. 370).
figure the number of applicance, general and special purpose circuits.
figure the number and kind of switches and covers (plates).
calculate the number of lighting fixtures.
select types of lighting fixtures.
figure the number of boxes (box/100) of wire staples. (NEC Art. 336.)
figure the number of wire nuts by size.
calculate the sizes and amounts of rigid metal conduit or EMT, connectors, coupiers, and fasteners.
figure the number of outlet receptacles and covers (plates).
use supply catalog for description, coding, pricing, etc.
complete estimate sheets

COMPETENCY NO. 7: TO INSTALL A SERVICE ENTRANCE PANEL

install service entrance panel at location
bore holes in concrete
install entrance conduit
install fasteners
- tamp-in
- screw anchor
- toggle bolt
- stud gun

COMPETENCY NO. 8: TO INSTALL ELECTRICAL DEVICE AND OUTLET BOXES

identify types of device and outlet boxes
identify types of fasteners
select appropriate device and outlet boxes and fasteners
locate placement of device and outlet boxes
- height from floor
- location from door openings
- position of box front with finish wall
- aesthetic and other factors in placement
- install device and outlet boxes

COMPETENCY NO. 9: TO INSTALL ELECTRICAL METALLIC TUBING

identify uses of EMT
cut conduit
ream (deburring) conduit
identify conduit size
use couplings and connectors
bend conduit with bender
determine number of bends
use supports and fasteners
connect boxes to conduit
splice and tap wire
identify general specifications for conduit

COMPETENCY NO. 10: TO INSTALL NON-METALLIC SHEATHED CABLE AND SPLICE WIRES

string wire to device boxes
cut to length
select wire fasteners
secure wires to studs
open new cable box
drill needed holes for wire
remove knockout plugs
install connectors
strip sheath cable
identify traveler wires
attach grounding clips and/or 8-32 grounding screw
attach wire nuts

COMPETENCY NO. 11: TO CONNECT WIRES IN CONVENIENCE BOXES, AND SERVICE ENTRANCE PANEL

identify traveler wires
identify common wire
connect common wire to silver terminal
select proper switch, receptical and light recepticals
connect hot wire to gold or brass terminal
identify hot wires
identify green or grounding wires (NEC300-5-[b])
connect grounding wire to green or grounding terminal
secure convenience with mounting screws
select covers for boxes
install covers

COMPETENCY NO. 12: TO INSTALL LOW VOLTAGE DEVICE (DOORBELL)

select power source for transformer placement
install bell switch (button)
install transformer
run wire
secure wire
install bell system to wall
drill holes
attach wire at transformer, button and bells

COMPETENCY NO. 13: TO DESIGN AND LAYOUT A PLUMBING SYSTEM

use drafting equipment
identify pipe sizes
identify pipe fittings
identify fixtures
use correct drafting procedures and plumbing symbols

COMPETENCY NO. 14: TO ESTIMATE WATER SUPPLY, FIXTURE AND DRAIN-WASTE-VENT (DWV) PLUMBING MATERIALS

use National Plumbing Code
compute size of Drain-Waste-Vent
calculate the number of lineal feet for all sizes and types of pipe & tubing
determine the quantity and style (catalog number) of fixtures
compute size of supply lines (hot and cold)
compute number of fittings
figure number of pipe supports
use supply catalog for determining estimate
complete estimate sheets

COMPETENCY NO. 15: TO INSTALL RESIDENTIAL DRAINAGE SOIL PIPE SYSTEM

drill holes in concrete sewer pipe with drill and masonry bit
use hammer and chisel to punch out hole in concrete sewer pipe
use hammer and chisel to cut cast iron pipe
use hammer and chisel to cut tile pipe
use soil pipe cutter to cut cast iron pipe
use soil pipe cutter to cut tile pipe
select neopreme gaskets by size
insert neopreme gaskets in hub
identify pipe by size and type
use builder's level to grade drain pipe

COMPETENCY NO. 16: TO INSTALL COPPER AND PVC PIPE

PVC
- identify pipe diameter
- apply glue (cement)
- glue pipe in all positions
- cut pipe to length
- identify types of glue (cement)
- identify fittings
- identify pipe type by composition
- identify pipe types by OD and ID measurements

COPPER
- identify tubing diameters
- abrade surface of tubing to be sweated
- abrade fittings to be sweated
- apply flux
- sweat tubing in all positions
- cut tubing to length
- identify solder types
- identify fittings
- identify tubing types by wall thickness
- identify tubing types by composition
- identify types of torchs

COMPETENCY NO. 17: TO INSTALL WATER CLOSET AND SET HUDE RIM SINK AND FIXTURES

set a sink with Hude rim
install faucets
install water supply tubes and fittings
install waste pipes and fittings
assemble and adjust drain fittings
use plumbers stainless putty
install closet bowl
install closet tank
apply wax ring
install closet bowl bolts
assemble and adjust ballcock assembly
assemble and adjust flush valve assembly

COMPETENCY NO. 18: TO APPLY ASPHALT SHINGLES AND APPROPRIATE FLASHING

interpret manufacturer's standards
install asphalt or composition shingles including starters and caps
install flashing (paper and metal)

COMPETENCY NO. 19: TO APPLY GYPSUM WALLBOARD

identify sizes of nails
identify types of joint compound
identify types of tape
tape (feather) an edge
finish (sanding) joint
cut and apply metal trim
tape horizontal and vertical joints
tape inside corners
fill nail "dimples"

COMPETENCY NO. 20: TO APPLY WALL PANELING

identify types, use and care of
- paneling
- nails
- adhesives
- trim

measure area to be covered
select panel by
- grain pattern
- color
- groove pattern sequence

clearance allowance
- vertical
- horizontal
- outlets
- doors-windows
- inside-outside corners
- corners

cut panel
- straight cuts
- curved cuts
- inside cutouts
- scribed cuts

vertical joint treatment
- remove and replace outlet recepticals
- glueing and nailing

cut and apply trim
- set and putty nails

COMPETENCY NO. 21: TO APPLY PAINT AND VARNISH FINISHES

identify types, use and care of
- spackling compound
- tack cloths
- varnishes
- paints
- lacquers
- masking tape
- sealers
- solvents
- primers
- caulking
- stains

interpret manufacturer's specifications.
clean spray gun, roller, brushes.
adjust spray gun.
select rollers and brushes for type of application.

COMPETENCY NO. 22: TO INSTALL VINYL OR VINYL ASBESTOS FLOOR TILE

identify types, uses and care of
- tile
- adhesives
- solvents
- underlayment (floor prep)

measure area to be covered
calculate quantity of materials
layout center line of room
spread adhesive
lay tile
fill defects
clean surface
prime surface
determine starting point of tile laying
cut tile
- straight lines
- contours
- cut-outs

determine patterns of tile
clean excess adhesive

COMPETENCY NO. 23: TO INSTALL VINYL SHEET FLOOR COVERING

use latex patching compound.
sand uneven joints
set nail heads (flush).
scribe room shape on felt pattern with dividers.
place felt on floor for pattern.
measure area to be covered.
calculate quantity of materials.
place pattern on vinyl sheet.
scribe on vinyl sheet from pattern.
cut vinyl sheet with linoleum knife.
cement vinyl sheet to floor.
trial fit vinyl sheet to floor.
match pattern at seams.
double cut seams.
apply adhesives.
use reference marks on floor and material (vinyl).
work bubbles to edges.
apply vinyl base.

COMPETENCY NO. 24: TO INSTALL CARPET

apply tack strip
- nail to wood
- nail and glue to concrete

use and care for types of padding
select padding for floor material
place padding within tack strip boundaries
tape padding seams
staple padding seams (glue)
measure room for size of cut (carpet)
use and care for types of carpet and carpet materials
measure and cut carpet from roll
place carpet for pattern and nap
trim carpet to rough size
prepare waste pieces for fill
prepare seams
tape seams
stretch carpet
- length
- width
- angle

set carpet in tack strip
trim excess carpet and tuck
install door metal

COMPETENCY NO. 25: TO INSTALL CERAMIC TILE

use and care for types of tile
use and care for types of adhesives
use and care for types of trim
measure area to be covered
calculate quantity of materials
cut tile
- straight
- curved
- contoured

glue tile to surface
apply grout to joints
caulk joints
seal grout
cut and apply
- base trim
- cap trim

Glossary

Items included are subject to different interpretations. These definitions are applicable for use in context of this material.

GLOSSARY

ANSI Standard
American National Standards Institutes
1450 Broadway
New York, New York 10018

Publisher - American Society of Mechanical Engineers
United Engineering Center
345 East 47th Street
New York, New York 10017

Certi-Split Manual of Handsplit Red Cedar Shakes, 1971
Clark, Donald H.
Institute of Forest Products
State of Washington
Red Cedar Shingle and Handsplit Shake Bureau
515 116th Ave, NE, Suite 275
Bellevue, WA 98004

Group R Occupancies — Division 3, Dwellings and Lodging Houses
Uniform Building Code
By: International Conference of Building Officials
5360 South Workman Mill Road
Whittier, California 90601

"Gypsum Wallboard Application" Georgia Pacific
Georgia Pacific, Gypsum Division
900 SW Fifth Avenue
Portland, Oregon 97204

National Electric Code (NEC)
National Fire Protection Association
Publication Sales Department
Battery March Park
Quincy, Massachusetts 02269

National Plumbing Code
National Association of Plumbing, Heating, and Cooling Contractors
1016 20th Street N.W.
Washington, D.C. 20036

"Paneling Book, The" Georgia Pacific Handbook, February, 1980
Georgia Pacific
900 S.W. Fifth Avenue
Portland, Oregon 97204

Red Cedar Shingle and Handsplit Shake Bureau, "Brochure 34" "Brochure 35"
Red Cedar Shingle and Handsplit Shake Bureau
515 116th Avenue, NE, Suite 275
Bellevue, WA 98004

"Residential Asphalt Roofing Manual" 1980 Standards
Asphalt Roofing Manufacturing Association
757 Third Avenue
New York, New York 10017

Sears "Electrical Wiring and Handbook"
Sears Roebuck and Co.
Chicago, Illinois 60684

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Uniform Building Code
International Conference of Building Officials
5360 South Workman Mill Road
Whittier, California 90601

Individual Student Record

A complete and accurate record may be used by students for job applications and for planning post-secondary education. For reference purposes, photocopies of individual student records may be given to the student. Original copies of all records should remain in the Student Services Department of the school.

School Stamp

Name of Student

This is to certify that the above named student has demonstrated proficiency in the following tasks:

Comp	Task	Date Completed	Instructor
1	Read and interpret blueprints		
2	Estimate material quantities & cost		
3	Place & finish concrete		
4	Lay block and brick		
5	Design & layout electrical system		
6	Estimate electrical materials		
7	Install service entrance panel		
8	Install electrical devices & boxes		
9	Install metallic tubing		
10	Install cable & splice wires		
11	Connect wires in box and panel		
12	Install low voltage device		
13	Design and layout plumbing system		
14	Estimate plumbing materials		
15	Install drainage system		
16	Install copper and PVC pipe A. copper water supply B. PVC waste system		
17	Install water closet and sink A. Hude rim sink B. water closet		

Comp	Task	Date Completed	Instructor
18	Apply shingles and flashing A. asphalt shingles B. wood shingles C. wood shakes		
19	Apply wallboard A. measure, cut and apply B. taping and filling C. metal trim		
20	Apply wall panel		
21	Apply paint and varnish A. latex with gun B. latex with roller C. varnish with brush		
22	Install vinyl floor tile		
23	Install vinyl sheet floor covering		
24	Install carpet		
25	Install ceramic tile		

School Official Signature

Student Signature

CLASS COMPETENCY RECORD

It is important that complete and accurate competency records be maintained for all students. Teachers, administrators, students and people in business and industry may benefit from this information.

RESIDENTIAL CONSTRUCTION
STUDENT RECORD CLASS ROSTER

	Read blueprints	Estimate quantities	Concrete	Brick and block	Layout electrical	Estimate electrical	Service panel	Devices and boxes	Metallic tubing	Cable splicing	Connect wires	Low voltage device	Layout plumbing	Estimate plumbing	Drainage system	Copper water supply	PVC waste	Hude rim sink	Water closet	Asphalt shingles	Wood shingles	Wood shakes	Apply wallboard	Tape wallboard	Metal trim	Wall paneling	Latex paint with gun	Latex paint with roller	Varnish with brush	Vinyl floor tile	Vinyl sheet	Carpet	Ceramic tile
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16		17		18			19			20	21			22	23	24	25
																A	B	A	B	A	B	C	A	B	C		A	B	C				

FOUNDATION PLAN SPECIFICATIONS

1. All spread footings are to be centered under walls.
2. All footings to have 2-#4 re-bars.
3. All rebars to be continuous around corners, and lapped 8" and tied at lap.
4. Concrete block walls.
   A. 9 5/8" x 8'-0" (high) concrete block wall with 4" brick ledge in front as shown. (11 courses @ 10" block, 1 course @ 6" block.)
   E. 94'-8" elevation to top of footing.
5. All footings shall be placed on level undisturbed soil.
6. Minimum soil bearing pressure is 1000 lbs. per sq. ft.
7. Concrete shall attain a minimum compressive strength of 2800 psi @ 28 days.
8. Concrete mix 1:2:3.
9. All mudsills to be foundation grade or pressure treated, bolted with 1/2" x 10" anchor bolt embedded 7" into concrete @ 6'-0" o.c. max. and within 1'-0" of all corners and openings.
10. The contractor shall provide adequate temporary vertical and lateral bracing all times during construction and until structure is completely tied together.
11. All framing lumber to be stud grade for all vertical applications, #2 and better, SPF or better species.
12. Fire blocking to be installed where called for in Uniform Building Code.
13. All exterior concrete slabs to be sloped 1/8" per foot away from house unless otherwise noted.
14. Interior openings are rough openings.
15. Cast-in-place concrete walls may be substituted for concrete block walls.

ROOM FINISH SCHEDULE

ROOM	WALLS	CEILING	FLOOR	TRIM	CABINETS/BLT-INS
Liv. Rm.	Painted	Textured	Carpeting	Red Oak * Stained & Varnished	N.A.
B. Rm. 1	Painted	Textured	Carpeting	Stained & Varnished	N.A.
B. Rm. 2	Painted	Textured	Carpeting	Stained & Varnished	N.A.
Bath	Painted-Enamel	Textured	Vinyl	Stained & Varnished	Red Oak-Stained & Varnished
Kitchen	Painted-Enamel	Textured	Vinyl	Stained & Varnished	Red Oak-Stained & Varnished
Garage	5/8" Drywall (firewall)	5/8" Drywall	Concrete	Pine	N.A.

*All walls and ceilings in house have 1/2" drywall finish smooth, ceilings are textured, floors are 5/8" underlayment unless otherwise noted. All wood trim is red oak except closet ribbons, shelving.

EXTERIOR FINISH MATERIALS

ROOF: #240 asphalt composition shingles
12" x 36", 3 tab; dark brown; over 15# felt

FASCIA: 1" x 8" redwood/cedar, painted

SOFFIT: 3/8" A-C fir plywood, painted

GUTTERS: 28 ga. galv. steel downspouts, splashblocks

SIDING: 5/8"-4'x8' T-111, 12" o.c. groove, rev. bd. and batten

BRICK VENEER: 3' high @ front elev. only, red common